(White Book)

Defense Special Weapons Agency
FY 1998/1999
Biennial Budget Estimates

Program Document

Research, Development, Test and Evaluation, Defense-Wide

(Supports Congressional Biennial Budget Estimates)
February 1997

BUDGET JUSTIFICATION FOR PROGRAM ELEMENTS OF

THE DEFENSE SPECIAL WEAPONS AGENCY

RESEARCH AND DEVELOPMENT PROGRAM

FY 1998/1999 Biennial Budget Estimates

February 1997

This document has been prepared to provide summary information on the Defense Special Weapons Agency, Research, Development, Test and Evaluation (RDT&E) Program to congressional committees during the FY 1998/1999 hearings. The R2 exhibits provide narrative information on all RDT&E Program Elements and projects.

DEFENSE SPECIAL WEAPONS AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE-WIDE

R-1 LINE ITEM ORDER INDEX

DEFENSE SPECIAL WEAPONS AGENCY

RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE-WIDE

ALPHABETICAL INDEX

DEFENSE SPECIAL WEAPONS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE-WIDE

RESEARCH PROGRAMS
($ in Thousands)

(THIS SUMMARY IS UNCLASSIFIED)

	FY 1996	FY 1997	FY 1998	FY 1999
Defense Special Weapons Agency; PE #0602715H				
6.2 Applied Research	227,320	192,298	211,971	221,702
Verification Technology Demonstration; PE #0603711H				
6.3A Advanced Technology Development	32,308	25,485	81,370	50,232
Total RDT&E Direct	259,628	217,783	293,341	271,934
Reimbursements	12,877	15,000	15,750	16,540
Total Program	272,505	232,783	309,091	288,474

EXHIBIT R-1

DEFENSE SPECIAL WEAPONS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE-WIDE

BUDGET ACTIVITY
($ in Thousands)

(THIS SUMMARY IS UNCLASSIFIED)

	FY 1996	FY 1997	FY 1998	FY 1999
BA 2 Applied Research	227,320	192,298	211,971	221,702
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EXHIBIT R-1

DEFENSE SPECIAL WEAPONS AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE-WIDE

FYDP PROGRAM
($ in Thousands)

(THIS SUMMARY IS UNCLASSIFIED)

	FY 1996	FY 1997	FY 1998	FY 1999
0602715H Defense Special Weapons Agency	227,320	192,298	211,971	221,702
0603711H Verification Technology Demonstration	32,308	25,485	81,370	50,232
Total RDT&E Direct	259,628	217,783	293,341	271,934
Reimbursements	12,877	15,000	15,750	16,540
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EXHIBIT R-1

DEFENSE SPECIAL WEAPONS AGENCY

SPECIAL ACCESS PROGRAMS

Program Element/Project, Title

0602715H/AL, Classified Program

R-2 exhibits are not required for this project due to classification.

Research and Development Project Listing
FY 1998/1999 Biennial Budget Estimates
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Program Element: #0602715H
Mission Area: #540 - Defense Special Weapons Agency

Title: Defense Special Weapons Agency
Budget Activity: Applied Research

($ in Thousands)		FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY2003
President's Budget (3/96)		227,964	195,131	212,640	222,693	223,501	228,945	0	0
POM Submission		227,374	195,131	212,640	222,693	223,501	228,935	233,985	239,212
Current Budget Submission		227,320	192,298	211,971	221,702	222,277	226,500	231,384	236,913
Project	Title								
AB	Test & Simulation Technology	49,431	45,435	56,357	56,470	54,965	53,007	54,018	55,081
AC	Weapon Systems Lethality	49,159	39,611	48,138	51,295	48,086	48,821	50,057	51,268
AE	Weapon Safety & Operational Support	25,488	24,896	30,499	33,416	34,282	37,109	37,926	38,755
AF	Weapon System Operability	46,230	40,167	45,845	48,247	51,474	53,605	55,136	57,271
AG	Scientific Computations & Information Systems	17,122	15,549	19,013	19,458	19,278	19,240	19,281	19,321
AI	Hard Target Tunnel Defeat and NTS Sustainment	9,390	5,148	9,712	10,427	11,821	12,365	12,613	12,864
AL	Classified Program	3,000	2,994	2,407	2,389	2,371	2,353	2,353	2,353
AM	Combating Terrorism	4,000	6,498	0	0	0	0	0	0
AN	Thermionics	10,000	3,000	0	0	0	0	0	0
AQ	Deep Digger	0	2,000	0	0	0	0	0	0
AR	Johnston Atoll Remediation	0	2,000	0	0	0	0	0	0
AX	TOPAZ International Program	8,500	0	0	0	0	0	0	0
AY	Bioenvironmental Hazards Research	5,000	5,000	0	0	0	0	0	0
Total		227,320	192,298	211,971	221,702	222,277	226,500	231,384	236,913

Research and Development Project Listing
FY 1998/1999 Biennial Budget Estimates
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Program Element: #0603711H
Mission Area: #540 - Defense Nuclear Agency

Title: Verification Technology Demonstration
Budget Activity: Advanced Technology Development

($ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY2003
President's Budget (3/96)	32,527	26,199	29,343	30,536	31,299	32,835	0	0
POM Submission	32,527	26,199	29,343	30,536	31,299	32,835	33,557	34,280
Current Budget Submission	32,308	25,485	81,370	50,232	43,838	42,996	43,648	44,493

Project	Title							
CA	Strategic Arms Control Technology	10,636	8,219	8,072	9,378	10,242	11,373	11,615	11,889
CB	Conventional Arms Control Technology	10,559	10,162	9,505	8,141	8,091	8,295	8,473	8,673
CC	Chemical Weapons Convention Technology	11,113	7,104	9,494	10,785	10,720	12,888	13,163	13,473
CD	Nuclear Arms Control Technology	0	0	54,299	21,928	14,785	10,440	10,397	10,458
Total		32,308	25,485	81,370	50,232	43,838	42,996	43,648	44,493

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)						DATE February 1997			
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2						R-1 ITEM NOMENCLATURE Defense Special Weapons Agency; 0602715H			
COST (In Millions)	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	Cost to Complete
Total 0602715H Cost	227.3	192.3	212.0	221.7	222.3	226.5	231.4	236.9	Continuing
Project AB Test & Simulation Technology	49.4	45.4	56.5	56.5	55.0	53.0	54.0	55.1	Continuing
Project AC Weapon Systems Lethality	49.2	39.6	48.1	51.3	48.1	48.8	50.1	51.2	Continuing
Project AE Weapon Safety & Operational Support	25.5	24.9	30.5	33.4	34.3	37.1	37.9	38.7	Continuing
Project AF Weapon System Operability	46.2	40.2	45.8	48.2	51.4	53.6	55.1	57.3	Continuing
Project AG Scientific Computations & Information Systems	17.1	15.6	19.0	19.5	19.3	19.2	19.3	19.3	Continuing
Project AI Hard Target Tunnel Defeat and NTS Sustainment	9.4	5.1	9.7	10.4	11.8	12.4	12.6	12.9	Continuing
Project AL Classified Program	3.0	3.0	2.4	2.4	2.4	2.4	2.4	2.4	Continuing
Project AM Combating Terrorism	4.0	6.5	0	0	0	0	0	0	Complete
Project AN Thermionics	10.0	3.0	0	0	0	0	0	0	Complete
Project AQ Deep Digger	0	2.0	0	0	0	0	0	0	Complete
Project AR Johnston Atoll Remediation	0	2.0	0	0	0	0	0	0	Complete
Project AX TOPAZ International Program	8.5	0	0	0	0	0	0	0	Terminated
Project AY Bioenvironmental Hazards Research	5.0	5.0	0	0	0	0	0	0	Complete

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1997
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	R-1 ITEM NOMENCLATURE Defense Special Weapons Agency; 0602715H

A. Mission Description and Budget Item Justification

This program develops the technology base needed to support national security issues relevant to nuclear and other advanced weapons and force application technologies. Program initiatives include the development, upgrade, and maintenance of advanced nuclear weapons effects simulators to address weapon systems operability issues; conventional weapon targeting and strike planning tools for regional contingencies; battle damage prediction/assessment of conventional strikes against fixed hardened facilities; and predictive models for dispersion and transport of hazardous particles generated by attacks of Weapons of Mass Destruction (WMD) facilities. These projects also serve to support sustainment of a core nuclear competence in the national industrial base. Efforts encompass:

-Support for national security policy implementation.
-Support to CINCs in nuclear force structure, logistics, operations and stockpile programs.
-Quantitative assessments of nuclear weapons systems with development and maintenance of nuclear weapons system safety databases.
-Development, upgrade, and operation of simulators (radiation, blast, thermal, radio frequency propagation and optical/infrared background effects) to characterize operability of military systems during and after exposure to nuclear disturbed environments.
-Physical and functional characterization of hardened underground structure designs and associated vulnerabilities.
-Determination of nuclear and conventional weapons effectiveness against fixed targets. Emphasis is on targeting technical support, hard target kill criteria, and damage assessment methodologies.
-Utilization of weapons effects information to support development of adaptive targeting methodologies.
-Support of high-performance computing capability to maintain and upgrade the Agency's predictive codes in radiation hydrodynamics, structural dynamics, and electromagnetic propagation supporting nuclear and conventional weapons effects assessments and their impact on weapon system lethality, operability, and safety.

The 6.2 programs under this Program Element (0602715H) are divided into thirteen projects. It should be noted that information concerning Project AL is classified per DoD Directive 0-5205.7, Para B.2.f.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1997
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	R-1 ITEM NOMENCLATURE Defense Special Weapons Agency; 0602715H

Project AB - Test & Simulation Technology - Development of effective, survivable, and affordable weapon systems requires a robust testing and simulation capability to support acquisition managers and decision makers. This project develops, provides and maintains unique DoD test and simulation facilities and enabling technologies that are used by the defense agencies, the Services and other federal agencies to evaluate the impact of hostile environments from conventional, nuclear and other special weapons on military or civilian systems and targets. These facilities provide blast, thermal, electromagnetic pulse, ionizing radiation and radio frequency propagation environments and testbeds to support DoD and national test requirements. This project leverages fifty years of testing expertise to investigate weapons effects and target response to a spectrum of hostile environments that could be created by proliferant nations or terrorist organizations with access to advanced conventional or weapons of mass destruction (nuclear, biological and chemical).

The project includes the upgrade of existing simulators to extend their utility and life, the decommissioning of obsolete simulators, and the development of new simulators, when required, to compensate as much as possible for the lack of underground testing (UGT). Additionally, it provides the innovative, enabling technologies that make simulator enhancements and new facilities technically feasible and cost effective. Specific programs in this project include: decommissioning of one radiation test center in California and two in Maryland; consolidation at existing test centers in California (1) and Tennessee (1), including the development, construction and checkout of the new DECADE x-ray facility; development of communications and radar propagation effects simulators, and infrared and optical scene generators; partnership with Sandia National Laboratories (DOE) to develop technologies in energy storage, power flow, plasma switches, debris shields, and radiation sources that are applicable to stockpile stewardship and DoD strategic systems sustainment; characterization, optimization and operation of the Large Blast/Thermal Simulator (LBTS) at White Sands Missile Range (WSMR), including the demonstration of a non-ideal airblast simulation capability; operation and maintenance of the ARES electromagnetic pulse (EMP) facility at Kirtland AFB; and target defeat assessments for precision-guided and special weapons against Weapons of Mass Destruction (WMD) related targets.

The project provides test beds for full- and sub-scale tests that focus on weapon-target interaction with fixed hardened facilities to include hardened above-ground bunkers, cut-and-cover facilities and deep underground tunnels. This effort supports the Services'

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Project AB - Test & Simulation Technology (cont'd)

requirements for hard target defeat testing and emphasizes teaming with the Services to assess weapon-target interaction of existing and developmental weapon systems. Specific activities include test bed design and construction, instrumentation and data collection, test coordination and execution, and post-test analysis and documentation.

This project relies on hardening and simulation technologies (Testable Hardware and Above Ground Testing(AGT)/UGT Correlation) funded under Project AF and supports the evaluation of weapons lethality accomplished in Projects AC and AI. Funded programs support JCS Joint Warfighting Capabilities: Control Space, Counterproliferation, Discriminate Attack, Global Reach and Situational Awareness, and also provide support to STRATCOM, EUCOM, USFK (PACOM) and ACOM.

FY 1996 Accomplishments

Test & Simulation ($20,925K)

- Continued Radar Nuclear Effects Corruptor and Simulator (RNECS) development, completed and incorporated 512x512 Nuclear Optical Dynamic Display System (NODDS) emitter array into the Nuclear IR Clutter Simulator (NICS).
- Continued disturbed atmospheric environment communication simulator development.
- Achieved LBTS Final Operational Capability.
- Continued ARES EMP facility operations and customer test support.
- Continued Tri-Service thermal test facility operations and customer test support, and characterized Non-Ideal Airblast (NIAB) simulation capability of LBTS.
- Provided high explosive (HE) simulation development, test support, and maintained the test facilities at White Sands Missile Range (WSMR) and at Kirtland AFB.
- Completed testing of seven Navy ship systems.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	R-1 ITEM NOMENCLATURE Defense Special Weapons Agency; 0602715H

Project AB - Test & Simulation Technology (cont'd)

FY 1996 Accomplishments

Applications of Nuclear Weapons Expertise ($15,578K)

Provided Nuclear Effects Links Simulator test support to the High Capacity Trunk Radio (HCTR) Program, and evaluated Defense Satellite Communications System connectivity for the Tactical Warning/Attack Assessment (TW/AA) assessment. Tests of the Universal Modem and tests for an integrated sensors program were continued.

Continued precision weapons testing in support of the Air Force, Army, and Navy hard target defeat test requirements.

Provided analytical support to ground shock, anti-penetration, lethality tests, and developed NIAB and LBTS calculational model.

U.S./Allied Survivability & Operability in Nuclear/Special Weapon Environments ($1,212K)

Finished construction of rogue state WMD facility mockup testbed at the Permanent High Explosives Test Site (PHETS).

Completed construction and testing of a quarter-scale structure for testing of weapon lethality and WMD collateral effects.

Evaluated communication system and advanced focal planes for Space Based Infrared System, evaluated Theater Missile Defense (TMD) and National Missile Defense (NMD) focal planes, communications and radar systems, and conducted communication/radar atmospheric effects hardware-in-the-loop testing for operability.

Test Facility Decommissioning ($3,942K)

Closed the Aurora simulator and initiated closure of the Blackjack simulators.

Weapon/Target Interaction ($528K)

Provided testbeds and instrumentation for ground shock, protective design, anti-penetration, and weapons lethality.

Rehabilitated target structures to support additional testing of precision weapons.

Radiation Simulators ($7,246K)

Completed DECADE Performance Assessment program.

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Project AB - Test & Simulation Technology (cont'd)

FY 1996 Accomplishments

Completed DECADE Facility at the Arnold Engineering Development Center (AEDC); installation of data acquisition system and simulator support systems ongoing.

Characterized and documented a high-fidelity warm x-ray source on Modular Bremsstrahlung Source (MBS); improved shot repeatability on the Double Eagle simulator; improved power flow on the Phoenix simulator; and transferred improved debris shield technology.

Conducted debris shield and diagnostic testing, and completed the insulator and longer life output switch testing, along with a demonstration of high-current inductive energy driven soft x-ray sources.

Initiated plasma, imaging, and current diagnostics development.

Supported operations of Phoenix, Casino/Tactical Gamma Simulator (TAGS), Double Eagle, Pithon, and MBS radiation simulators.

FY 1997 Plans

Test & Simulation ($20,202K)

Continue to operate radiation simulators at Physics International and begin operation at the AEDC.

Close Phoenix and Casino/TAGS at the Naval Surface Warfare Center; complete closure of Blackjack simulators.

Provide HE simulation infrastructure and test support, and maintain PHETS facility at WSMR and Chestnut Site at Kirtland AFB.

Complete RNECS development and begin initial operational tests, complete Advanced Channel Simulator (ACS) development and begin initial operational tests, evaluate advanced sensor focal planes in NICS, provide advanced SATCOM Simulation Test Support. Continue communication/radar atmospheric effects simulator participation in operability assessment/warfighting exercises, and evaluate Upgraded Early Warning Radar (UEWR) operability for NMD.

Deliver NODDS chips to Navy for advanced radar and sensor fusion for Maverick missile evaluations.

Continue LBTS operation and maintenance; conduct blast/thermal development testing.

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Project AB - Test & Simulation Technology (cont'd)

Continue operation of Tri-Service test facility, evaluate advanced thermal test needs/incorporate fidelity improvements.

Test Navy ship decking and 1/4- scale masts, Air Force satellite antenna mast (SPACECOM), and initial Israeli sub-scale structure.

Continue testing of vehicle types as identified by the U.S. Army Nuclear and Chemical Agency.

Weapon/Target Interaction ($4,334K)

Conduct ground shock, structural response, protective design, anti-penetration, and lethality tests.

Construct test target facilities, provide utilities and maintain the construction capability infrastructure needed for the counterproliferation (CP), hard target defeat (HTD), and Hard and Deeply Buried Target (HDBT) programs.

Continue to develop signature requirements and munitions effectiveness assessment for hard target defeat.

Radiation Simulators ($20,549K)

Begin DECADE bremsstrahlung radiation source installation.

Continue soft x-ray sources development for DECADE, larger area (10 times increase) debris shields, and bremsstrahlung spectral diagnostics.

Optimize DECADE module bremsstrahlung performance.

Install low-voltage, warm x-ray source, fast risetime hot x-ray source, and mixed gas cold x-ray source on Double Eagle at Physics International, and develop gamma/beams capability for AEDC.

Counterproliferation ($350K)

Construct industrial targets for the assessment of WMD Component damage, target response, and collateral effects for conventional weapons and enhanced payloads.

FY 1998 Plans

Test & Simulation ($22,403K)

Continue to operate Double Eagle, Pithon, and MBS simulators.

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Project AB - Test & Simulation Technology (cont'd)

Begin planning evaluation of feasibility to close Double Eagle and Pithon simulators and development of gamma/beams machine(s).

Continue to provide HE simulation infrastructure and test support, and maintain PHETS facility at WSMR and Chestnut Site at Kirtland AFB.

Complete RNECS development for TMD and begin initial operational tests, complete ACS development and begin initial operational tests, evaluate advanced sensor focal planes in NICS, provide advanced SATCOM Simulation Test Support to assess TMD architecture communications link operability, continue communication/radar atmospheric effects simulator participation in operability assessment/warfighting exercises, and evaluate TMD Ground-Based Radar (GBR) operability.

Continue advanced SATCOM Simulation Test Support to MILSATCOM and Universal Modem.

Evaluate off-the-shelf technology for improvements in thermal and pressure diagnostics capabilities of LBTS. Test three Navy ship deckings, one United Kingdom communications shelter and continue testing an Israeli sub-scale structure.

Weapon/Target Interaction ($8,580K)

Continue to execute ground shock, structural response, protective design, anti-penetration, and lethality tests in support of customer requirements.

Continue to construct and rehab test target facilities, provide utilities and maintain the construction infrastructure needed for the CP, HTD, and HDBT programs.

Continue to develop signature requirements and munitions effectiveness assessment for hard target defeat.

Radiation Simulators ($25,124K)

Complete bremsstrahlung installation and begin installation of soft x-ray capability for DECADE simulator.

Develop improved fidelity source for Nuclear Weapons Effects (NWE) testing on the DECADE simulator, plasma imaging and current diagnostics, and high-current, long-time implosion soft x-ray sources.

Improve radiation sources and instrumentation on the DECADE simulator.

Begin very large ($500cm^2$) debris shield development for cold x-ray testing.

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Project AB - Test & Simulation Technology (cont'd)

Counterproliferation ($250K)

Continue construction of industrial targets for the assessment of WMD Component damage, target response, and collateral effects for conventional weapons and enhanced payloads.

FY 1999 Plans

Test & Simulation ($24,276K)

Continue to operate the Double Eagle, Pithon, and MBS simulators. Continue planning for close-out, if appropriate, of Double Eagle, Pithon, and MBS simulators.

Continue to provide HE simulation infrastructure and test support, and maintain PHETS facility at WSMR and Chestnut Site at Kirtland AFB.

Complete RNECS development for NMD and begin initial operational tests.

Develop advanced optical scene generation/projection and mitigation techniques for TMD GBR in a nuclear-disturbed environment, provide advanced SATCOM/UEWR Simulation Test Support to assess NMD architecture operability.

Continue communication/radar atmospheric effects simulator participation in operability assessment/warfighting exercises.

Evaluate NMD GBR for operability, and continue advanced SATCOM Simulation Test Support to MILSTAR and Global Positioning System upgrades.

Complete evaluation of NMD target acquisition and tracking algorithms against improved NODDS IR scene and evaluate for fusion with RNECS.

Complete modifications to LBTS for blast and thermal diagnostics. Test one Navy ship decking and six Israeli tactical systems.

Weapon/Target Interaction ($9,765K)

Continue to execute ground shock, structural response, protective design, anti-penetration, and lethality tests in support of customer requirements.

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Project AB - Test & Simulation Technology (cont'd)

Continue to construct and rehab test target facilities, provide utilities and maintain the construction capability infrastructure needed for the CP, HTD, and HDBT programs.

Continue to develop signature requirements and munitions effectiveness assessment for hard target defeat.

Radiation Simulators ($21,979K)

Continue simulator consolidation efforts and soft x-ray radiation source capability on the DECADE simulator.

Continue DECADE preplanned product improvement program and evaluate need for second DECADE module. Begin operation of Gamma/beams machine(s).

Improve risetime of hot x-ray source on DECADE.

Demonstrate argon soft x-ray sources, and high-fidelity bremsstrahlung source on the DECADE simulator.

Initiate improved radiation source spectral diagnostics development.

Counterproliferation ($450K)

Begin rehab of industrial targets for the assessment of WMD Component damage, target response, and collateral effects for conventional weapons and enhanced payloads.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	R-1 ITEM NOMENCLATURE Defense Special Weapons Agency; 0602715H

Project AC - Weapons Systems Lethality - Building upon core DSWA nuclear competencies in nuclear effects and target response, this project addresses the lethality of the full spectrum of weapons, including nuclear and advanced conventional weapons, against the target base of today and tomorrow -- ranging from ultra-hard underground facilities to above ground, unhardened surface facilities and other special facilities that may be associated with the production, storage or deployment of weapons of mass destruction. Helping to maintain the continued effectiveness of the nuclear deterrent, this project also seeks to provide decision makers and warfighters expanded conventional weapon options against well-protected, high-priority targets. The program relies extensively on advanced numerical methods, as well as laboratory scale experiments, intermediate and full-scale field tests and operational test data to quantify functional and physical damage criteria and collateral effects. Project results will be provided to operational planners through analytic prediction tools, multimedia hypertext databases, and technical manuals. Central to this support is an automated expert system to assist in pre-strike target planning and post-strike battle damage assessment. Technology developed in this project will also enable civil agencies to assess engineering designs to mitigate direct and collateral damage from terrorist attacks such as occurred at the Oklahoma City Federal Building and Khobar towers attack in Saudia Arabia. Additionally, the technology developed directly supports force protection issues.

On a broader scale, improvements in weapon effects and target response codes will be used to upgrade and expand physics-based modeling and simulation in support of Distributed Interactive Simulation (DIS) under Project AE. These improved codes include: coupled finite difference-finite element codes, structure-medium interaction codes, groundshock propagation codes suitable for jointed and/or layered media and high fidelity gas dynamic codes capable of predicting the transport of hazardous aerosol clouds over complex terrain. The understanding of weapon-target interaction resulting from this project will support the generation of weapon system requirements for the changing worldwide target base and provide a quantitative basis for planning contingency operations against high value targets. It will also improve the understanding of target/weapon interactions and their consequences for battle damage prediction and assessment. This project also includes the Electro-Thermal Chemical (ETC) gun advanced technology and projectile lifting body programs per Memorandum of Agreement (MOA) with the Navy; ETC gun technologies for the direct-fire applications, per MOA with the Army; the development of microwave source technology for warfighter applications; and the development of high energy density capacitors for compact energy storage on mobile weapon platforms.

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Project AC - Weapons Systems Lethality (cont'd)

Project AB, Test & Simulation Technology, provides the testbeds to support weapons lethality tests in this project. The computer tools and databases developed under this project support the execution of Project AI. This project supports the following JCS Joint Warfighting Capabilities: Counterproliferation, Discriminate Attack, and Global Reach.

FY 1996 Accomplishments

Nuclear Weapons Effects Phenomenology ($3,563K)

Supported DoD (STRATCOM) evaluations of nuclear and conventional weapons capabilities to counter ultra hard targets.
Assessed nuclear effects against ultra hard targets.
Developed a weapons output library for each fuzing system in the stockpile for use in weapons effects models.
Completed source output calculations/W76 (nuclear weapon model) coupling curves.
Distributed two volumes of non-US nuclear weapon outputs.
Developed a computer model which STRATCOM used to analyze dust effects on the aircraft engines in SIOP 96.

Application of Nuclear Weapons Expertise ($13,503K)

Developed and completed evaluation of several high energy density dielectric materials for capacitive storage.
Designed and constructed a test article using Project AB testbeds and executed a test series to quantify the synergistic lethality effects of blast and fragments on hardened targets.
Completed small-scale lab tests to define the penetration limits for advanced penetrators and developed and validated a cumulative damage model for concrete.
Developed damage models for Munition Effects Assessment (MEA). Tunnel lethality module added to MEA.

Enhanced Payloads Options ($925K)

Provided non-ideal airblast analytical support to the response testing of Army battlefield equipment for United States Army Nuclear Chemical Agency (USANCA).

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Project AC - Weapons Systems Lethality (cont'd)

Weapon Target Interaction ($5,772K)

Completed the Joint Service Manual for the Design and Analysis of Hardened Structures (DAHS).

Produced a preliminary CD-ROM version of the DAHS manual, called Protective Structures Analysis and Design System (PSADS).

Executed, using AB testbeds, a test series that evaluated survivability issues associated with hardened fixed structures.

Released Hazard Assessment and Consequence Analysis (HASCAL), versions 1.0 and 2.0 (Beta).

Conducted tests at Nevada Test Site (NTS) and Norway which developed databases for tunnel portal closure attack.

Developed preliminary UNIX PORT for HASCAL.

Incorporated cloud-shine algorithm into HASCAL.

Bomb Damage Assessment ($1,001K)

Supported the DIPOLE PRIDE demonstrations of battle damage assessments on a well-controlled test article using infrared and seismic signatures.

US/Allied Survivability and Operability in Nuclear/Special Weapon Environments ($2,896K)

Updated the Joint Munitions Effectiveness Manual, Structural Response, DAHS manual with an expert design advisor.

Electro-Thermal Chemical Gun ($7,716K)

Began the technology transfer to the U.S. Army and Navy for their Airborne Tactical Data System and follow-on Engineering and Manufacturing Development.

Completed wind tunnel testing of projectile designs.

Nuclear/Other Advanced Weapons Effects ($13,178K)

Developed High-Power Radio Frequency (RF) test system, and completed lab demonstration.

Began advanced RF source development and continued foreign asset testing.

Explored High Power Microwave (HPM) associated technology designed for defense of friendly assets.

Continued to develop and apply computerized weapons effects models for the defeat of hard targets and tunnels.

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Project AC - Weapons Systems Lethality (cont'd)

Developed computerized weapon effects model for attacking multiple rocket launchers (MRLs).

Modeling and Simulation ($605K)

Expanded the Virtual Interactive Target (VIT) to include weapons storage facilities, other hard targets, and 14 additional weapon types. Displayed weapon effects on dynamic terrain. Established VIT capability in DSWA Modeling and Simulation Center.

FY 1997 Plans

Nuclear Weapons Effects Phenomenology ($6,253K)

Develop concepts and requirements for demonstrating nuclear weapons capabilities to achieve damaging mechanical effects to very hard or very deep targets.

Develop non-ideal airblast phenomenology to support USANCA warfighting issues and to assist STRATCOM in target planning.

Apply airblast phenomenology to enhance understanding of the consequence of a terrorist weapon detonation.

Develop a weapons output library for potential proliferants' weapons for use in weapons effects models.

Complete W87 and W88 (nuclear weapon models) Coupling Curves.

Complete initial draft of non-US weapon output volume on tactical weapons.

Application of Nuclear Weapons Expertise ($12,354K)

Develop the processing capability for scaled up manufacturing of a high energy density dielectric material.

Conduct static outdoor demonstration of electromagnetic effects on weapons systems.

Begin to explore HPM hardening technology for advanced applications.

Conduct static outdoor demonstration of Electromagnetic (EM) effects on weapons systems.

Begin Alternate Source Development.

Complete long pulse HPM megawatt class source.

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Project AC - Weapons Systems Lethality (cont'd)

Construct breadboard and brassboard pulse power supplies to drive the new high density capacitor.
Develop a target damage model for advanced conventional ICBM warheads.
Initiate an effort to define the vulnerability of nuclear reactors and nuclear re-processing facilities to weapons effects.
Develop a design module to resist advanced warhead concepts.
Validate predictive methods for advanced warheads MEA. Incorporate advanced warheads into MEA.
Start design and analysis of hardened structures.
Expand MEA software to additional fixed targets and weapons.
Deliver advanced fluid/structural computational codes.

Weapon/Target Interaction ($13,854K)

Re-design and renovate a test article using Project AB testbeds and execute a test program to define the vulnerability of components, subsystems and systems found in high value fixed targets including tunnels.
Develop fragility models for the components in high value fixed targets including tunnels.
Initiate a field test program to define the penetration limits for advanced penetrators into weathered granite.
Expand the targeting methodology for the hard-to-defeat targets by including additional lethality models.
Produce a final CD-ROM version of the DAHS manual (PSADS).
Initiate work on the Automated Design Advisor for the DAHS Manual.
Begin gun testing of composite projectile flight body for indirect fire.
Complete advanced ETC indirect fire cartridge testing.
Begin full-scale testing of ETC direct fire cartridges for the M256 main tank gun.
Release nuclear source terms for HASCAL, version 2.0, including bio-kinetic models for human response, medium resolution local weather model, and refine source expulsion models, both UNIX and PC based.
Expand the VIT to include additional weapons and target types and integrate operational bombing ranges. Provide weapon effects visualization capability to Synthetic Theater of War (STOW) Distributed Interactive Simulation (DIS) exercise.

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Project AC - Weapons Systems Lethality (cont'd)

Procure specialized hardware/software for integration of weapons effects, structural response, nuclear phenomenology aides in DIS/High Level Architecture (HLA) environment.

US/Allied Survivability and Operability in Nuclear/Special Weapon Environments ($520K)

Complete analysis tool for STRATCOM to assess aircraft dust survivability for planned Single Integrated Operation Plan (SIOP) routes.

Test and Simulation ($6,630K)

Initiate effort to remove the artificial cut off of dynamic pressure environments in the height-of-burst (HOB) weapon effects code for STRATCOM.

Develop geologic models needed for nuclear MEA targeting and treaty verification.

FY 1998 Plans

Nuclear Weapons Effects Phenomenology ($8,710K)

Develop simulation methods to demonstrate nuclear weapons capabilities, to include damaging target effects upon ultra hard, very deep targets.

Complete development of non-ideal airblast phenomenology to support USANCA warfighting issues and assist STRATCOM in weapon use.

Apply nuclear phenomenology to enhance understanding of the consequence of a terrorist weapon detonation.

Develop a weapons output library for potential proliferants' weapons for use in weapons effects models.

Complete 2D modeling of U.S. and selected foreign weapon outputs and coupling.

Application of Nuclear Weapons Expertise ($14,670K)

Validate a target damage model for advanced conventional ICBM warheads.

Expand program to define the weapons effects vulnerability of nuclear reactors and nuclear re-processing facilities to additional reactor types.

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Project AC - Weapons Systems Lethality (cont'd)

Construct prototype compact power distribution source.
Conduct modified live-fire outdoor demonstration of EM effects on weapons systems.
Develop HPM hardening technology for Command and Control Warfare (C2W).
Begin to explore HPM associated technology for Command and Control Warfare (C2W).
Begin to develop advanced long pulse HPM source technology.

Weapon/Target Interaction ($17,206K)

Complete a test program to define the vulnerability of components, subsystems and systems found in high value fixed targets.
Complete the development of fragility models for components.
Complete work on the Automated Design Advisor for the DAHS Manual.
Continue work on precision experiments for data gaps in DAHS methodologies, which expand to new methodologies.
Complete gun testing of long-range composite projectile flight body.
Begin integration study of ETC technology incorporation into Army tank system.
Release heavy water reactor damage model.
Support project VULCAN. Produce vulnerability and collateral effects with complete nuclear fuel facilities module.
Provide technical support, hardware/software to integrate weapons effects, target response codes into distributive environment.
Continue advanced ETC indirect fire testing and continue full-scale testing of ETC direct fire cartridges, M256 main tank gun.

US/Allied Survivability and Operability in Nuclear/Special Weapon Environments ($370K)

Update analysis tools for STRATCOM to assess B2 aircraft dust survivability for planned SIOP routes.

Test and Simulation ($7,182K)

Extend initial nuclear MEA models to develop site and regional models for ground shock and ultra-hard target response.
Perform testing and validation of particle formation models for urban nuclear event fallout prediction.

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Project AC - Weapons Systems Lethality (cont'd)

FY 1999 Plans

Nuclear Weapons Effects Phenomenology ($7,835K)

- Provide modern targeting tools to support nuclear weapons capabilities to damage or target effects including very hard or very deep targets.
- Assist STRATCOM in weapon use and apply nuclear phenomenology to enhance understanding of the consequence of a terrorist weapon detonation.
- Complete a weapons output library for potential proliferants' weapons for use in weapons effects models.
- Distribute Tactical Foreign Weapon Output volume.

Application of Nuclear Weapons Expertise ($17,803K)

- Conduct advanced technology demonstration for the Services.
- Conduct high-level testing of compact power distribution source prototype.
- Complete definition of the vulnerability of nuclear reactors and nuclear re-processing facilities to weapons effects.
- Conduct advanced technology demonstration for the Services.
- Complete advanced long pulse HPM source technology.

Weapon/Target Interaction ($17,033K)

- Work with Army to integrate ETC technology into operational system.
- Begin full-scale testing of ETC direct fire cartridges for the XM291 main tank gun.
- Develop vulnerability/collateral effects tools for uranium mining/milling facilities module and transport model rainout/washout.
- Provide technical support, hardware/software to integrate weapons effects, target response codes in distributive interactive envrionment.
- Initiate a test program to develop a target damage model for aboveground fixed targets.
- Implement joint service component vulnerability model into the MEA.

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Project AC - Weapons Systems Lethality (cont'd)

Produce a final CD-ROM version of Revision 1 of the DAHS manual.

US/Allied Survivability and Operability in Nuclear/Special Weapon Environments ($270K)

Update analysis tool for STRATCOM to assess aircraft dust survivability for planned SIOP routes.

Test and Simulation ($8,354K)

Test and validate all Height of Burst airblast environments for all models used in PD-CALC/STRATCOM. This program will develop remote sensing capability.

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Project AE - Weapon Safety and Operational Support -This project is critical to the maintenance of a safe, secure and reliable nuclear deterrent, given that the enduring stockpile will retain weapons far beyond their designed life. Stockpile support efforts in this project include nuclear weapons stockpile technology for weapon system sustainment, probabilistic risk-based system safety assessments, and nuclear physical security policy/requirements validation. Reliability efforts include participation and assistance to Dual Revalidation, Annual Certification, and the Stockpile Stewardship Program. This project performs research and development in support of nuclear contingency planning, force structure deployment and employment options, innovative nuclear command and control concepts, nuclear mission planning, vulnerability assessments, safety assessments, advanced survivability concepts, and theater missile defense against Weapons of Mass Destruction (WMD) delivery systems and warheads. Vulnerability assessments of DoD and allied fixed and mobile Command, Control and Communications (C3) assets subjected to WMD effects are also part of this project. This project includes the Modeling and Simulation Center, which provides integration of weapons effects, downwind hazard prediction models and force effectiveness models to users in acquisition, training, exercises, operations other than war, and warfighting. DSWA provides oversight, technical support and curriculum review for the Defense Nuclear Weapons School (DNWS) and other DoD nuclear training activities.

This project is in direct support of Presidential Decision Directives and taskings and requirements from OSD, the Joint Staff and CINCs. Relevant directives include National Security Strategy of Engagement and Enlargement, National Security Science and Technology Strategy, National Military Strategy, Joint Strategic Capabilities Plan, Presidential Decision Directives, Defense Planning Guidance, and prioritization memorandums from CINCs. These efforts have been closely coordinated with Joint Staff, OSD offices, CINCs and Services, Department of Energy, Federal Emergency Management Agency and the Federal Bureau of Investigation. The thrust of this project supports the JCS Joint Warfighting Capabilities of Counterproliferation and Global Reach.

FY 1996 Accomplishments

Nuclear Operations ($17,268K)

Continued the Weapon System Safety Assessment (WSSA) of the B-52H Aircraft insuring it remains certifiable for use as a Nuclear Deterrent.

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Project AE - Weapon Safety and Operational Support (cont'd)

Completed the Phase 2 Fire Resistance Enhancement study of the enduring nuclear stockpile; continued the safety analyses of solid propellant sensitivity to ensure the nuclear surety and safe handling of the Minuteman III system.

Conducted tech-base efforts in the area of fuel fire and energetic materials and initiated efforts in electrical/lightning effects to validate the proper and safe storage of DoD's nuclear stockpile.

For Dual Revalidation DSWA provided technical support and recommendations to the Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Matters (ATSD(NCB)), Joint Staff, Services, STRATCOM and other Combatant Commanders as required for nuclear stewardship including analysis and recommendations of the impacts on DoD.

Assisted ATSD(NCB) and STRATCOM in developing the process and the report for the Annual Certification program.

Analyzed Dual Capable Aircraft deployments for OSD planning and certification.

Completed analysis on enhanced planning capability against mobile strategic nuclear threats as required by Joint Staff.

Began development of a prototype computer-based training system for nuclear planning, emphasizing adaptive nuclear planning using the NATO Nuclear Planning System (NNPS) parameters.

Conducted a force-on-force exercise to evaluate and validate existing DoD Policy standards and equipment on Physical Security of Special Weapons.

Provided Planning and Operations Support to STRATCOM through automated strategic planning capabilities including tanker, B-52, and Conventional Air-Launched Cruise Missile (CALCM) planning.

Initiated the nuclear planning system target data feed which provides intelligence planning data in support of NATO Nuclear Planning.

Initiated the development of a methodology for STRATCOM which includes the impact of fallout effects in achieving effective denial or delay of enemy access to key installations as a result of a nuclear strike.

Provided analytical support to assess STRATCOM's capability to effectively meet national objectives involving the Single Integrated Operations Plan (SIOP) while reducing its complexity.

Conducted proof-of-principle testing and transitioned the Carrier Battle Group Defense System to the USN.

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Project AE - Weapon Safety and Operational Support (cont'd)

Initiated, in response to Tri-service Board and specified Army and Navy requirements on advanced communications survivability, an effort to enhance systems survivability of nuclear and non-nuclear forces.

Demonstrated the prototype of an operational capability for 36-hour weather forecasts on workstations adding to the effectiveness of predicting consequences of WMD releases.

Developed and validated an artificial geographic database for exercises and wargames involving the use of WMD.

Provided system assessment and analytical concept support for effectiveness estimates on current stockpile weapons using Extended Air Defense Simulation (EADSIM) scenarios.

Continued model integration/technical support and completed the Analysis and Assessments Phase I contract allowing for quick analysis as required for OSD, Services, and Joint Staff, on real world WMD consequence analysis and counterproliferation planning.

Began development of mission/consequence analysis for the Agent Defeat Weapon (ADW) Phase 0 Analysis of Alternatives (AOA) for HQ Air Combat Command and San Antonio Air Logistics Center/Nuclear Weapons Integration (SA-ALC/NWI).

Education/Training to Maintain Core Competencies ($1,161K)

As the DoD executive agent for sustaining nuclear weapons training expertise, continued development of the Automated Nuclear Weapons Training System for the DNWS.

Continued nuclear operational training support to CINCs, OSD and Services.

Supported DoD and CINC exercises and wargames with WMD/target response analysis.

Modeling and Simulation ($2,442K)

Provided modeling and simulation support through creation of a Modeling and Simulation Center at DSWA.

Provided the capability for interactive data transfer between non-Agency and Agency developed mission planning codes and DSWA-developed models to facilitate adaptive planning (Common Operational Modeling, Planning and Simulation Strategy (COMPASS)).

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Project AE - Weapon Safety and Operational Support (cont'd)

Test and Simulation ($399K)

Provided Support of RDT&E through a cell at Field Command, DSWA, which provides support for the Permanent High Explosive Test Site, WSMR, NM.

Nuclear Weapons Effects Phenomenology ($4,218K)

Conducted Balanced Survivability Assessments of U.S. and Allied hardened underground and mobile systems to identify single point vulnerabilities and potential mitigation approaches and to facilitate the development of investment strategies for facility survivability enhancements.

Conducted functional assessments of foreign underground C4I facilities, identified single point vulnerabilities, and provided targeting support to the CINCs.

Identified critical nodes in the National Defense Infrastructure System.

FY 1997 Plans

Nuclear Operations ($15,016K)

Provide DSWA core expertise operational studies and assessments to meet the nuclear force requirement issues and needs levied by OSD, Services, Joint Staff and Nuclear Weapons Council (NWC).

Complete the WSSA of the B-52H aircraft and continue tech-base efforts in the areas of fuel fire and energetic materials and electrical/lightning effects.

Initiate a WSSA for a designated weapons system.

Provide assistance, reviews, critiques, analyses and recommendations to ATSD(NCB) Joint Staff, Services, and STRATCOM governing Stockpile Stewardship and Dual Revalidation paying particular interest in the resulting DoD impacts.

Continue the safety assessment and analysis of Minuteman III solid propellant and monomethylhydrazine (hypergolic) fuels for the Services (Air Force in particular), NWC, ATSD(NCB), STRATCOM, and the Project Officer's Group.

Perform an analysis of European area-wide Theater Missile Defense Command and Control requirements to support SHAPE.

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Project AE - Weapon Safety and Operational Support (cont'd)

Support AFNORTH WMD deterrence requirements for force survivability, posture and employment options through analysis of Extended Air Defense requirements.

Deliver an editable, digital, artificial geographic database with supporting forces, weather, and installation data for exercises and wargames involving the use of WMD.

Complete the development of an automated planning system for the airborne portion of the SIOP for STRATCOM and the development of an interface between NATO NNPS and US/NATO intelligence systems.

Initiate an adaptive planning system software program to develop a deployable strategic planning capability for STRATCOM and initiate a modernized software interface between data collection sources and the Nuclear Planning and Execution System (NPES) for STRATCOM and Joint Staff.

Continue developing a prototype computer-based training capability for nuclear planning, emphasizing adaptive nuclear planning using NNPS parameters.

Continue the nuclear planning system target data feed which provides intelligence planning data in support of NATO Nuclear Planning.

Continue the development of a methodology for STRATCOM which includes the impact of fallout effects in achieving effective denial or delay of enemy access to key installations as a result of a nuclear strike.

Provide analytical support to assess STRATCOM capability to effectively meet national objectives involving the SIOP while reducing its complexity.

Begin development of an analytical framework that facilitates WMD deterrence approaches to the needs of multi-regional scenarios.

Conduct a force-on-force exercise to evaluate and validate policy standards as designated by the Security Policy Verification Committee (SPVC).

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Project AE - Weapon Safety and Operational Support (cont'd)

Provide quick turn analysis on WMD consequence issues for OSD, Services and Joint Staff and provide weapons effects analysis to weapons Project Officer's Groups and weapons modification programs as requested.

Continue development of templates and training required for Partnership for Peace program activities.

Continue supporting system assessment and analytical weapons concepts as required; develop mission and consequence analysis for HQ ACC's Agent Defeat Weapon phase studies and AOAs.

Education/Training to Maintain Core Competencies ($1,275K)

Complete development of the Automated Nuclear Weapons Training System and transition it to DNWS.

Continue development, improvement, and integration of course materials for the DNWS.

Continue nuclear operational training support to CINCs, Services, and OSD.

Continue development of DoD general interest nuclear training program.

Continue support for DoD and CINC exercises and wargames with WMD/target response analysis and counterproliferation.

Modeling and Simulation ($1,629K)

Achieve full operational capability of the DSWA Modeling and Simulation Center, including connectivity via Defense Simulation Internet (DSI).

Provide technical support for exercises and war games.

Integrate DSWA weapons effects codes into COMPASS program.

Integrate WMD modules into campaign level analytical and assessment models to analyze effects of these weapons on campaign plans.

Initiate Analysis and Assessments Phase II contract to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.

Update and refine support database per CINCs, Services, and Joint Staff guidance and continue development of consequence analysis of WMD counterproliferation programs.

Continue to develop EADSIM based scenarios for additional studies to support STRATCOM requests.

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Project AE - Weapon Safety and Operational Support (cont'd)

Nuclear Weapons Effects Phenomenology ($1,505K)

Provide an automatic adaptive capability for 36-hour weather forecasts in support of operational exercises and test support, which will add to the effectiveness of WMD consequence predictions.

US/Allied Survivability & Operability in Nuclear Designated Advanced Weapons Environments ($5,471K)

Extend functional assessments of foreign underground facilities to include storage, WMD, and operations-types to identify "Achilles' heel" for hard and mobile systems.

Assist operational users in choosing investment strategies to mitigate and/or eliminate vulnerabilities.

Assess impact of emerging technologies on C3I systems and our nuclear deterrent.

Conduct Integrated Systems Assessments of selected national defense infrastructure facilities.

Continue Advanced Data Communications Survivability Program analyses and assessments.

Demonstrate Prototype Survivability Planning System and initiate follow-on Survivability Integration Demonstration Program.

FY 1998 Plans

Nuclear Operations ($19,133K)

Complete the analysis of monomethylhydrazine (hypergolic) propellant for Minuteman III.

Continue experimental testing to develop a tech-base for fuel fire, energetic materials and electrical/lightning.

Continue WSSA for the designated weapon system.

Provide safety assessment support to the NWC, ATSD(NCB), STRATCOM, Services, and Project Officer's Group.

Initiate experimental testing to develop a tech-base in the area of combined mechanical/thermal environments.

Complete the modernized software interface between NPES and its data sources for STRATCOM and Joint Staff.

Complete prototype development computer-based training capability for nuclear staff planners, emphasizing adaptive nuclear planning.

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Project AE - Weapon Safety and Operational Support (cont'd)

Continue the adaptive planning system software development for a deployable strategic planning capability required by STRATCOM.

Complete and transition the nuclear planning system target data feed which provides intelligence planning data in support of NATO.

Complete the development of a methodology for STRATCOM which includes the impact of fallout effects in achieving effective denial or delay of enemy access to key installations as a result of a nuclear strike.

Continue to provide analytical support to assess STRATCOM's capability to effectively meet national objectives involving the SIOP while reducing its complexity.

Continue to develop an analytical framework that facilitates alternative WMD deterrence approaches to the needs of multi-regional scenarios.

Conduct an annual force-on-force exercise to evaluate and validate policy standards as designated by the SPVC.

Continue to provide quick turn analysis on WMD consequence issues for OSD, Services, and Joint Staff and provide weapons effects analysis to Project Officer's Groups and weapons modification programs as requested.

Continue development of templates and training required for Partnership for Peace program activities.

Continue to support system assessment and analytical weapons concepts analysis for DoD, JCS, CINCs and Services.

Develop mission and consequence analysis for HQ ACC's Agent Defeat Weapon phase studies and AOAs.

Education/Training to Maintain Core Competencies ($1,050K)

Provide nuclear operational training support to CINCs, Services, and OSD.

Continue development of general interest DoD nuclear training program.

Continue development, improvement, and integration of course materials for the DNWS.

Support DoD and CINC exercises and wargames with WMD/target response analysis.

Nuclear Weapons Stockpile Management ($600K)

In support of stockpile stewardship and reliability, continue DSWA participation in, and support to, the Dual Revalidation

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Project AE - Weapon Safety and Operational Support (cont'd)

program with research, and technical analysis assessments and reports.

Provide technical support, progress reports and recommendations to ATSD(NCB), Joint Staff, Services, STRATCOM and other Combatant Commanders as required.

Provide support to the Annual Certification program and to the service weapons life-extension programs.

Modeling and Simulation ($1,624K)

Increase DSWA Modeling and Simulation Center capability with an operational INTEL-S node.

Continue integration of WMD modules into campaign level analytical & assessment models.

Provide technical operational consequence analysis support for exercises and wargames.

Continue Analysis and Assessments Phase II contract to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.

Update and refine support database per CINCs, Services and Joint Staff guidance and continue development of consequence analysis of WMD counterproliferation programs.

Continue development of EADSIM based scenarios for additional studies to support STRATCOM requests.

Nuclear Weapons Effects Phenomenology ($1,470K)

Deliver an operational, adaptive, user-friendly, high resolution 36 hour weather forecast capability to CINCs and Services.

US/Allied Survivability & Operability in Nuclear/Designated Advanced Weapons Environments ($5,622K)

Deliver underground facility characterization and vulnerabilities guide and computer assessment tools to support CINCs and intelligence community.

Conduct Balanced Survivability Assessments and Integrated Survivability as tasked by CINCs.

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Project AE - Weapon Safety and Operational Support (cont'd)

Conduct proof-of-principle technology prototype testing to assess mitigation effects capability and technology aimed at increasing survivability for the warfighter by enhancing reliability of systems the warfighter depends upon.

Weapon/Target Interaction ($1,000K)

Integrate additional DSWA peculiar weapon effects and target response models into High Level Architecture (HLA) and CINC planning tools.

Integrate weapons effects and target response models in an environment which can be visualized for training, exercises and Bomb Damage Assessment.

FY 1999 Plans

Nuclear Operations ($19,950K)

Complete the safety assessment for the third major weapons system in support of Nuclear Weapon System and Special Stockpile Safety.

Continue experimental testing to develop a tech-base for fuel fire, energetic materials and electrical/lightning.

Continue experimental testing to develop a tech-base in the area of combined mechanical/thermal environments.

Provide safety assessment support to the NWC, ATSD(NCB), STRATCOM, Services and Project Officer's Group.

Conduct Forces Support technical analyses as required by OSD, Services, Joint Staff, and NWC on nuclear infrastructure, stockpile planning, force structure, storage issues, weapons safety and security, theater missile defense, counterproliferation, planning, and international military and political security issues.

Conduct technical analyses to support CINCs, Services and Joint Staff on operational force planning, counterproliferation, nuclear forces, command and control, and regional security issues in light of the changing international security environment.

Continue the adaptive planning system software development for a deployable strategic planning capability required by STRATCOM.

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Project AE - Weapon Safety and Operational Support (cont'd)

Complete analytical support assessing STRATCOM's capability to effectively meet national objectives involving the SIOP while reducing its complexity.

Complete development of an analytical framework that facilitates alternative WMD deterrence approaches to the needs of multi-regional scenarios.

Conduct an annual force-on-force exercise to evaluate and validate policy standards as designated by the SPVC.

Continue to provide quick turn analysis on WMD consequence issues for OSD, Services, and Joint Staff and provide weapons effects analysis to weapons Project Officer's Groups and weapons modification programs.

Continue development of templates and training required for Partnership for Peace activities.

Continue supporting system assessment and analytical concepts analysis for DoD, JCS, CINCs, and Services.

Develop mission and consequence analysis for HQ ACC's Agent Defeat Weapon phase studies and AOAs.

Education/Training to Maintain Core Competencies ($1,050K)

Provide nuclear operational training support to CINCs, Services, and OSD.

Continue development of general interest DoD nuclear training program.

Continue development, improvement, and integration of course materials for the DNWS.

Support DoD and CINCs exercises and wargames with WMD/target response analysis.

Nuclear Weapons Stockpile Management ($750K)

In support of stockpile stewardship and reliability, continue DSWA's participation in, and support to, the Dual Revalidation program with research, technical analysis, and assessment reports.

Continue to provide ATSD(NCB) with progress reports.

Provide technical support and recommendations to ATSD(NCB), Joint Staff, Services, STRATCOM and other Combatant Commanders.

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Project AE - Weapon Safety and Operational Support (cont'd)

Continue DSWA support to the Annual Certification program and support to the service weapons life-extension programs.

Modeling and Simulation ($3,183K)

Upgrade and refine operations of the Modeling and Simulation Center.

Provide an integrated program for analysis and testing of alternate strategies, force employment options and technologies.

Continue to provide technical operational consequence analysis support for exercises and wargames.

Include WMD use and effects in a joint theater-level simulation.

Implement the Analysis and Assessments program to provide real-time support to Services through enhanced infrastructure, deployment teams, integrated models, and technical support.

Update and refine support database per CINCs, Services, and Joint Staff guidance and continue development of consequence analysis of WMD counterproliferation programs.

Continue to develop EADSIM based scenarios for additional studies to support STRATCOM requests.

Nuclear Weapons Effects Phenomenology ($1,471K)

Transition 36 hour weather forecast modeling capability to the CINCs and Services for use in WMD consequence predictions.

US/Allied Survivability & Operability in Nuclear/Designated Advanced Weapons Environments ($6,002K)

Conduct Balanced Survivability Assessments and Integrated Survivability as tasked by CINCs.

Conduct proof-of-principle technology prototype testing to assess mitigation effects capability and technology aimed at increasing survivability for the warfighter by enhancing reliability of systems the warfighter depends upon.

Weapon/Target Interaction ($1, 010K)

Develop visualization tools for DSWA weapon effects models that are compatible with the HLA.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Applied Research - BA2	R-1 ITEM NOMENCLATURE Defense Special Weapons Agency; 0602715H

Project AF - Weapon System Operability - Current and future warfighters and weapon systems, including the associated Command, Control, Communications, Computers and Intelligence (C4I) and support systems, must be able to tolerate and operate effectively through a spectrum of hostile battlefield environments. Planned efforts emphasize the development and demonstration of innovative and cost effective technologies to sustain the functional survivability of U.S. and Allied Forces and systems to advanced conventional weapons and limited nuclear attack. The military systems of interest include those that support warfighting missions in the air, on land, at sea, or in space.

This project constitutes the DoD's residual science and technology expertise in nuclear and related survivability matters. It develops and demonstrates affordable strategies and hardening technologies for U.S. systems; transfers the technical products to acquisition program offices; conducts component, subsystem, system and end-to-end performance tests and assessments as requested by the Services and CINCs; and provides support to the Office of the Secretary of Defense on technical and policy matters that relate to the acquisition of survivable systems and strategic system sustainment. Specific programs in the project include: development and demonstration of the enabling technologies for ensuring the continued availability of special materials and radiation tolerant microelectronics and photonic devices; development and demonstration of affordable hardening and mitigation methods that treat the adverse effects from electromagnetic, natural space and ionizing radiation, nuclear electromagnetic pulse, high power microwave and nuclear atmospheric environments; direct support to warfighters by predicting and quantifying the operational impact of nuclear, biological and chemical (NBC) and conventional battlefield environments on systems and personnel; development and demonstration of cost effective system design and test certification techniques for testable hardware that does not require underground nuclear tests; methods for measuring and increasing soldier effectiveness on NBC battlefields; performance and cost analysis to support the Defense Acquisition Board; and joint efforts with system program offices to apply DSWA's expertise and technologies to specific Service applications.

This project provides the testable system design rules and protocols that are used by users of nuclear effects simulators that are funded in Project AB. It also supports the following JCS Joint Warfighting Capabilities: Information Superiority, Counterproliferation, Electronic Warfare, and Precision Force.

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Project AF - Weapon System Operability (cont'd)

FY 1996 Accomplishments

Test & Simulation ($1,371K)

- Completed Aboveground Test (AGT)/Underground Test (UGT) correlation of electronic component data from AGTs and UGTs since 1983.
- Provided upset/burnout testing analysis of advanced technologies.
- Completed collection and coordination of optical UGT data for extrapolation to future materials.
- Developed Hardware-in-the-Loop (HWIL) Testbed to demonstrate sensor response in nuclear environment.

Nuclear Weapons Effects Phenomenology ($4,675K)

- Incorporated a ground-based radar model for Theater Missile Defense (TMD) Program and supported cost performance tradeoffs for sensor operability issues for Space-based Infrared System (SBIRS) in nuclear environments.
- Continued an assessment of SBIRS sensor operability for Geosynchronous and Highly Elliptic Orbit (GEO & HEO) satellites.

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($6,751K)

- Completed radiation anti-emetic drug assessment and recommendation for NATO.
- Finalized sensor demonstration design and test protocols, upgraded protocols based on combined effects environments, and evaluated spacecraft and missile interceptor test protocols.
- Integrated draft guidelines for program manager survivability plan development for missiles; produced a draft MIL-STD on Hardness Assurance, Maintenance, & Surveillance.
- Assisted Allied Command Europe with operational exposure guidance for potential low-level radiation exposures to troops in Bosnia.

Radiation-Tolerant Microelectronics, Materials, and Electro-optics ($13,439K)

- Demonstrated 4-megabit Static Random Access Memory (SRAM) technology in support of radiation hardened microelectronic technology.
- Tested and evaluated a prototype radiation resistant 1-megabit SRAM.

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Project AF - Weapon System Operability (cont'd)

Provided component level (i.e., Analog Signal Processing, Digital Signal Processing, and Focal Plane Array Assembly testing.

Completed combined Qualified Manufacturers List radiation hardness assurance procedures.

Finished Jam-Resistant Secure Communications satellite terminal tests and published revised MIL-STD 2169B.

EM Hardening of Electronics and Optics ($5,879K)

Developed a program to advance state-of-the-art in Electromagnetic Pulse/High Power Microwave (EMP/HPM) hardening technology.

Nuclear/Designated Advanced Weapons Effects ($5,282K)

Developed a test protocol for sensors and designed and tested protocols for missiles/interceptors and spacecraft.

Modeling & Simulation ($8,833K)

Developed Consolidated Radiation Environments Software that assesses the consequences of natural and nuclear, biological and chemical weapons environments.

Completed clutter model for Over-the-Horizon (OTH) Radar for the Southern Command (SOUTHCOM) drug interdiction program. In addition, delivered Phase 2 Strategic C4I Assessment Tool ("STRATCAT") to STRATCOM and completed space modeling design and conducted initial interactive operation of all modules.

Sponsored joint DSWA-CBDCOM NBC Modeling and Simulation Conference.

Supported the 1996 Olympic Emergency Operations Center.

FY 1997 Plans

Nuclear Weapons Effects Phenomenology ($8,200K)

Complete initial environmental support for the SBIRS sensor operability for GEO and HEO satellites.

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Project AF - Weapon System Operability (cont'd)

Develop Beta version of the Nuclear Environment Simulation (NucSim) engagement level phenomenology module for Monte Carlo evaluation of TMD and National Missile Defense (NMD).

Complete initial analyses of the communications and radar functions for the end-to-end evaluation of the NMD elements/architectures.

Implement detailed communications link simulation, and cooperative engagement control, modeling in the DSWA version of the Army's System Performance Intercept Evaluation Tool (SPIET).

Support operational analysis of BMDO radars in nuclear environments.

Complete assessment of SBIRS sensor operability for GEO and HEO satellites.

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($17,621K)

Begin testing of spacecraft, missile, and sensor demonstration test objects for validation of design and test protocols.

Demonstrate software solutions to minimize radiation effects on system operability.

Complete AGT testing and evaluation of materials for correlation with UGT data.

Develop optical material test coupons to identify the relationship of design specification to material response for protocol development.

Conduct combined effects testing of optical elements to resolve protocol issues.

Complete commander's guidance for operations in low-level radiation environments.

Evaluate the end-to-end operability of NMD architectures/elements in nuclear-disturbed environment.

Evaluate the vulnerability of systems and C4I nodes exposed to a nuclear-disturbed environment.

Assess/implement innovative, low-cost EMP/HPM hardening technology concepts for Service equipment survivability.

Continue assessment and testing of critical fixed-ground-based C4I facilities.

Develop PC-based Electromagnetic (EM) protection tool.

Regional Version Consequence Tool Set (CENTCOM ADR).

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Project AF - Weapon System Operability (cont'd)

Radiation-Tolerant Microelectronics, Materials, and Electro-optics ($11,755K)

- Demonstrate, test, evaluate, and qualify production-worthy, radiation-tolerant 1-megabit Complimentary Metal Oxide Semiconductor/Silicon-on-Insulator (CMOS/SOI) and bulk SRAMs for U.S. Air Force Space and Missile Command (USAF/SMC) and BMDO.
- Demonstrate, test and evaluate radiation-tolerant SOI Bipolar Complementary Metal Oxide Semiconductor microelectronics for mixed signal applications in support of USN, USAF and BMDO requirements.
- Demonstrate radiation-tolerant, low-power 200k gate array for USAF/SMC and BMDO use.
- Perform initial demonstration of radiation tolerant 16-megabit SRAM integrated circuit technology required by USAF and BMDO.
- Complete development of the Microelectronic and Photonics Test Bed (MPTB) in preparation for the FY98 flight of the MPTB flight vehicle in support of USN, USAF and BMDO.

Nuclear Operations ($600K)

- Deliver upgraded version of "STRATCAT" C4I assessment tool to STRATCOM.
- Support communications operability assessment for SBIRS and complete longwave noise program for fleet submarine broadcasting system.
- Develop long-wave sensors (passive and active) for imaging underground structures/Weapons of Mass Destruction (WMD) storage facilities for non-proliferation/counterproliferation (NP/CP).

Technology Transfer ($741K)

- Develop initial space environmental prediction forecast model and an equatorial ionosphere clutter model for the system analysis of a new OTH radar to be installed in Puerto Rico.
- Integrate Space Weather Prediction Model (ISM).
- Initiate EMP phenomenology upgrade program.

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Project AF - Weapon System Operability (cont'd)

Applications of Nuclear Weapons Expertise ($1,250K)

Demonstrate human variability for radiation-induced and fire suppression-induced performance decrement in Modular Semi-Automated Forces.

Demonstrate connectivity for infrastructure data exchange with the Intel Net.

FY 1998 Plans

Nuclear Weapons Effects Phenomenology ($9,650K)

Continue environmental support for the SBIRS sensor operability for satellites in GEO and HEO.

Continue analyses of the communications and radar functions for the end-to-end evaluation of the NMD elements/architectures associated with changing threats.

Support continuing operational analysis of BMDO radars in nuclear environments.

Initial distribution of improved DSWA SPIET with new, detailed interceptor homing models.

Continue assessment of SBIRS sensor operability for GEO and HEO satellites.

Develop and maintain EMP core competency programs for DSWA sponsored programs for both defensive and offensive applications.

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($20,373K)

Correlate material testing data to predict system-level performance.

Develop AGT/UGT threat correlation derived from the completed materials data sets.

Develop structural response data for missiles, penetration aids and reentry vehicles from UGT and data.

Upgrade testable hardware protocols based on validation testing of sensor subsystems in nuclear environments.

Finalize spacecraft missile design and test protocols.

Continue testing for validation of sensor design and test protocols.

Continue development and evaluation of low-level radiation standards and equipment for NATO review.

Complete evaluation of the end-to-end operability of NMD/TMD architectures/elements in nuclear-disturbed environment.

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Project AF - Weapon System Operability (cont'd)

Conduct SBIRS operability assessment, and evaluate the vulnerability of systems exposed to a nuclear-disturbed environment.

Demonstrate affordable EMP/HPM design and test technologies, develop system hardening technology against advanced HPM techniques, and continue assessment and testing of critical fixed-ground-based C4I facilities.

Create EMP/HPM hardening cost model tool.

Radiation-Tolerant Microelectronics, Materials, and Electro-optics ($13,070K)

Test and evaluate radiation-tolerant analog and digital microelectronics, demonstrate radiation-hardened 4M SRAM prototype.

Demonstrate, test and evaluate hardened SOI microelectronics for sensor applications in support of USAF and BMDO.

Evaluate advanced photonics and compound semiconductor technology for DoD space-based applications.

Demonstrate, test and evaluate radiation-tolerant 16M SRAM integrated circuit technology for USAF and BMDO.

Demonstrate nanoelectronics technology in support of USN, USAF and BMDO requirements.

Nuclear Operations ($700K)

Continue upgrade of "STRATCAT" C4I assessment tool for STRATCOM.

Support communications operability assessment for SBIRS and complete longwave noise prediction program for fleet submarine broadcasting system.

Technology Transfer ($802K)

Develop initial space environmental prediction forecast model and models to detect and track cruise missiles by OTH radars.

Test and validate ISM for 50th Space Weather Squadron.

Applications of Nuclear Weapons Expertise ($1,250K)

Develop nuclear weapon detonation model in Distributed Interactive Simulation compatible format.

Demonstrate Geographic Information System (GIS) based assessments of potential NBC effects on OCONUS-based military forces.

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Project AF - Weapon System Operability (cont'd)

FY 1999 Plans

Nuclear Weapons Effects Phenomenology ($9,448K)

- Complete assessment of SBIRS sensor operability for GEO and HEO satellites.
- Continue environmental support for the SBIRS sensor operability for satellites in GEO and HEO.
- Continue analyses of the communications and radar functions for the end-to-end evaluation of the NMD elements/system.
- Support continuing operational analysis of BMDO radars in nuclear environments.
- Distribution of DSWA SPIET with stereo processing models for space borne optical sensor data.
- Continue support of EMP phenomenology upgrade.

US/Allied Survivability & Operability in Nuclear/Special Weapon Environments ($21,308K)

- Finalize configuration control electronics database for qualification testing.
- Develop design protocols for advanced optical systems.
- Complete AGT/UGT threat correlation for penetration aids, missile and reentry vehicle materials/structures.
- Finalize sensor design and test protocols and upgrade protocols based on combined effects environments.
- Finalize sensor design and test protocols, and evaluate spacecraft and missile interceptor test protocols.
- Complete development and assessment low-level radiation standards and equipment for NATO.
- Evaluate the end-to-end operability of advanced architectures/networks in nuclear-disturbed environments.
- Continue to assess SBIRS architecture operability, and evaluate the vulnerability of C4I systems exposed to nuclear-disturbed environment.
- Continue application of innovative, low-cost EMP/HPM hardening technology and propose candidate EM standards and guidelines in accordance with the new technology.
- Continue assessment and testing of critical, fixed-ground-based C4I facilities.

Radiation-Tolerant Microelectronics, Materials, and Electro-optics ($15,390K)

- Demonstrate, test and evaluate a radiation-tolerant, low-power 1000K gate array.

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Project AF - Weapon System Operability (cont'd)

Demonstrate, test and evaluate application-specific integrated circuits, including a digital signal processor.

Demonstrate radiation-tolerant photonics technology for DoD space-based applications.

Investigate and characterize single event effects in photonic devices and deep-submicron microelectronics for USAF and BMDO.

Develop, test and evaluate improved radiation-tolerant Charge Coupled Device technology.

Nuclear Operations ($300K)

Deliver final version of "STRATCAT" C4I assessment tool to STRATCOM.

Support geomagnetic EMP sensor network for Comprehensive Test Ban Treaty, and longwave sensor technology of imaging underground storage of WMD for NP/CP, and develop initial space environmental prediction forecast model.

Technology Transfer ($801K)

Transition code to operations and deliver Contract Data Requirements Lists for ISM; define and develop tools to use Defense Meteorological Satellite Program ionospheric data; initiate program to develop an advanced space weather prediction tool.

Applications of Nuclear Weapons Expertise ($1,000K)

Demonstrate how human performance is degraded in NBC environments using DIS compatible models for use in wargames.

Demonstrate GIS representations of NBC open source and intelligence data.

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Project AG—Scientific Computations & Information Systems. This project provides High Performance Computing (HPC), computational databases, information products, and advanced numerical models that enable DSWA's customers, researchers, and RDT&E contractors to answer questions about nuclear and advanced special weapons effects. Applications, required by the warfighters, involve packaging nuclear data and physical understanding into advanced computational and information products that enable new capabilities for warfighter interaction and visualization. Models, codes, and information products are developed to aid the design of experiments, predict types and levels of measurements required, establish system design requirements, assess performance, and provide system-specific predictions of weapons effects to DoD planners. Nuclear issues often require use of advanced computational resources, e.g., for investigation of the physics of weapon-target interactions, and for extrapolating test results into areas for which tests are no longer possible. This has required DSWA to develop a world-class high performance computing architecture with high bandwidth communications. This capability, currently with a hub at Los Alamos National Laboratory, is scheduled to transition to the new DoD HPC architecture over the FYDP. DSWA's Data Archival and Retrieval Enhancement (DARE) information system (a hierarchical database tailored to the specific needs of the researcher, the system designer, and developer) is supported by this project. This project funds the "graybeard" efforts for collection of unique and potentially perishable nuclear data with appropriate prioritization based on technical value. The "Alliance", a collaboration involving DSWA, DoD and other non-DoD organizations with nuclear research interests, resources, and missions, has been constituted as a mechanism for identifying cost effective, cooperative approaches for ensuring data preservation and other research and development matters of mutual interest. The principal thrusts respond to warfighter requirements for survivable systems and effective weapons in the Joint Warfighting Technology Areas of Discriminate Attack, Global Reach, and Counterproliferation.

FY 1996 Accomplishments

Test & Simulation ($324K)

Provided centralized CRAY resources for testing and simulation activities.

Assisted users with technical advice on employing CRAY assets.

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Project AG—Scientific Computations & Information Systems (cont'd)

Continued DATACOM wide-area, high-speed connections.
Provided interactive visualization/animation of computer-produced computations.

Nuclear Weapons Effects Phenomenology ($1,574K)

Provided centralized CRAY resources for nuclear weapons effects activities.
Assisted users with technical advice on employing CRAY assets.
Continued DATACOM wide-area, high-speed connections.
Provided interactive visualization/animation of computer-produced computations.

Nuclear Operations ($5,058K)

Provided centralized CRAY resources for nuclear operations activities.
Assisted users with technical advice on employing CRAY assets.
Continued DATACOM wide-area, high-speed connections.
Provided interactive visualization/animation of computer-produced computations.
Managed network, including annual assessment of circuit utilization, price/performance, requirements, changes, and acquisitions.
Provided science and technology Information Analysis Center support through broad-based research analysis.
Disseminated three nuclear weapon effects computational aids.
Published Science and Technology Digest .
Began revision of the Effects Manual-One (EM-1) Technical Handbook.
Published the NATO version of the EM-1.

Applications of Nuclear Weapons Expertise ($4,320K)

Provided centralized CRAY resources for nuclear weapons expertise activities.
Assisted users with technical advice on employing CRAY assets.
Continued DATACOM wide-area, high-speed connections.
Provided interactive visualization/animation of computer-produced computations.

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Project AG—Scientific Computations & Information Systems (cont'd)

Data Archival and Retrieval Enhancement (DARE) ($2,499K)

Upgraded DSWA's DARE to accept test data and loaded high priority test data.

Continued development of DARE test data and waveform standards.

Nuclear Weapons Technical Assistance Publications ($518K)

Provided support for publication and distribution of the scientific and technical reports, documentation, and the research efforts of DSWA.

Modeling and Simulation ($2,829K)

Provided centralized CRAY resources.

Assisted users with technical advice on employing CRAY assets.

Continued DATACOM wide-area, high-speed connections.

Provided interactive visualization/animation of computer-produced computations.

Demonstrated anelastic version of Gudunov code for application to weather/dust transport for Advanced Computational Methods.

Demonstrated non-premixed turbulent combustion version of the Gudunov code and applied it to the bomb-in-structure problem.

FY 1997 Plans

Test & Simulation ($35K)

Develop individual nuclear weapons effects computational aids.

Demonstrate DSWA's advanced numerical models at technical symposia.

Nuclear Weapons Effects Phenomenology ($3,136K)

Conclude development of DARE test data and waveform standards.

Provide scientific and technical information services and products as the DoD wide repository for test photos, films, data, test records and other information products.

Provide text to update Glasstone's book, The Effects of Nuclear Weapons, the standard reference for nuclear weapons effects.

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Project AG—Scientific Computations & Information Systems (cont'd)

Disseminate Science and Technology Digest.

Review, approve, and archive perishable nuclear test data.

Infrastructure ($5,144K)

Continue to provide computer operations support through CRAY resources.

Provide continuous technical assistance for users of CRAY and other DoD HPC platforms and high performance networks to display supercomputer results.

Continue DATACOM computational support by providing annual support for Wide Area Network connection with additional T-1 backbone and high speed links.

Continue providing ongoing technical assistance and network management and conduct annual assessment of circuit utilization, price/performance, and requirements.

Initiate acquisitions to create a scientific computing data center at HQ DSWA and facilitate data researchers access to DoD HPC modernization plan resources.

Install DSWA hubsite for enhanced connectivity to DoD HPC resources, and fully interconnect with the Defense Research and Engineering Network (DREN).

Provide broad-based science and technology Information Analysis Center research support.

Develop a nuclear targeting CD-ROM.

Applications of Nuclear Weapons Expertise ($920K)

Add original data to Nuclear Effects Data Management Assessment System.

Initiate development of computational aids for total characterization of nuclear weapons effects.

Begin to update two more chapters of EM-1.

Update the unclassified textbook entitled, The Effects of Nuclear Weapons.

Distribute the engineering handbook entitled, EM-1 Technical Handbook.

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Project AG—Scientific Computations & Information Systems (cont'd)

Data Archival and Retrieval Enhancement (DARE) ($3,483K)

Expand archival of airblast, thermal, and other nuclear test data, reports, and photography for archival/retrieval in DSWA's DARE.

Initiate development and testing of computational tools employing diverse visual displays that are scenario-driven and exchange data and results with other warfighter displays.

Initiate development of video/text interrelationship with hyperlink capability.

Nuclear Weapons Technical Assistance Publications ($575K)

Provide common administrative support (personnel, equipment, maintenance) for publication and distribution of DSWA's scientific and technical reports.

Counterproliferation ($2,056K)

Provide Advanced Computational Methods support by completing code work on explicit radiation modeling. Continue combustion/afterburning modeling for incendiary devices.

Provide centralized CRAY resources in support of counterforce portion of Counterproliferation Advanced Concept Technology Demonstration (ACTD).

Continue DATACOM computational support by providing wide-area connections in support of counterforce portion of Counterproliferation ACTD.

Weapon/Target Interaction ($200K)

Benchmark the Gudunov Adaptive Mesh Refinement (AMR) code with reactive burn model against large scale experiments under the structure Advanced Technology Demonstration.

FY1998 Plans

Test & Simulation ($35K)

Conclude development of integrated nuclear weapons effects computational aids.

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Project AG—Scientific Computations & Information Systems (cont'd)

Provide Advanced Computational Methods support to the International Shockwave Congress and demonstrate DSWA's advanced modeling techniques.

Nuclear Weapons Effects Phenomenology ($3,339K)

Provide scientific and technical information services and products as the DoD wide repository for test photos, films, data, test records and other information products.

Continue revision of Glasstone's book, The Effects of Nuclear Weapons, the standard reference for nuclear weapons effects.

Disseminate Science and Technology Digest.

Review, approve, and archieve nuclear test data.

Infrastructure ($7,402K)

Continue to provide computer operations support through centralized CRAY resources. Provide continuous technical assistance for users of CRAY and other DoD HPC platforms and high performance networks to supply display of supercomputer results.

Continue DATACOM computational support by providing annual support for Wide Area Network.

Provide broad-based science and technology Information Analysis Center research support.

Continue computational support by providing annual support for the communication network and upgrade/acquire the network management equipment for the HQ DSWA hubsite.

Integrate DSWA's network with the DoD's HPC DREN network.

Investigate new communication technologies.

Beta test and distribute nuclear targeting CD-ROM.

Applications of Nuclear Weapons Expertise ($845K)

Distribute integrated nuclear weapons effects computational aids.

Disseminate electronic version of EM-1 Technical Handbook.

Continue to develop and upgrade computational aids of nuclear weapons effects on various electronic media.

Disseminate individual nuclear weapons effects computational aids.

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Project AG—Scientific Computations & Information Systems (cont'd)

Disseminate two and update two more chapters of EM-1.

Data Archival and Retrieval Enhancement (DARE) ($4,617K)

Expand archival of information and knowledge of nuclear weapons, other Weapons of Mass Destruction (WMD) and Agency mission areas for retrieval in DSWA's DARE as outlined in DARE 2000 Master Plan.

Develop and test computational tools employing diverse visual displays that are scenario-driven and exchange data and results with other warfighter displays.

Continue development of video/text interrelationship with hyperlink.

Nuclear Weapons Technical Assistance Publications ($585K)

Provide common support (personnel, equipment, maintenance) for publication and distribution of DSWA's scientific and technical reports.

Counterproliferation ($1,930K)

Provide Advanced Computational Methods support by validating code work on explicit radiation modeling.

Continue combustion/afterburning modeling for incendiary devices.

Validate advanced numerical models for complex flow/chemistry.

Provide centralized CRAY resources in support of counterforce portion of Counterproliferation ACTD.

Continue DATACOM computational support by providing wide area connections in support of counterforce portion of Counterproliferation ACTD.

Weapon/Target Interaction ($200K)

Add a reactive burn model to the Gudunov AMR code and validate against experimental data.

Radiation Simulators ($60K)

Perform a numerical study for the Advanced Radio Frequency Payload concept in support of DoD programs.

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Project AG—Scientific Computations & Information Systems (cont'd)

FY1999 Plans

Test & Simulation ($55K)

Disseminate integrated nuclear weapon effects computational aid.

Provide Advanced Computational Support by hosting the International Shockwave Conference.

Nuclear Weapons Effects Phenomenology ($2,997K)

Provide scientific and technical information services and products as the DoD wide repository for test photos, films, data, test records and other information products.

Continue computer operations support by providing centralized CRAY resources to researchers, DSWA customers and RDT&E contractors.

Continue DATACOM computational support by providing wide area connections.

Disseminate Science and Technology Digest.

Review, approve, and archive perishable nuclear test data.

Disseminate updated The Effects of Nuclear Weapons.

Infrastructure ($7,260K)

Continue computational support by providing annual support for the communication network and upgrade/acquire the supercomputing equipment for the HQ DSWA data center.

Provide classified access channels for the HQ DSWA data center.

Acquire hierarchical file storage for classified systems.

Continue assessment of circuit utilization and the investigation of new communication and networking technologies.

Continue to provide broad based science and technology Information Analysis Center research support.

Applications of Nuclear Weapons Expertise ($550K)

Continue to provide computer operations support through centralized CRAY resources. Provide continuous technical assistance for users of CRAY and other DoD HPC platforms and high performance networks to supply display of supercomputer results.

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Project AG—Scientific Computations & Information Systems (cont'd)

Continue DATACOM computational support by providing wide-area, high-speed connections.

Update two more chapters of DSWA's EM–1.

Data Archival and Retrieval Enhancement (DARE) ($5,731K)

Expand archival of information and knowledge of nuclear weapons, other WMD and Agency mission areas for retrieval in DSWA's DARE as outlined in DARE 2000 Master Plan.

Continue development and testing of computational adjuncts employing diverse visual displays that are scenario–driven and exchange data and results with other warfighter displays.

Provide on–line capability for video/text interrelationship with hyperlink capability.

Nuclear Weapons Technical Assistance Publications ($595K)

Provide common support (personnel, equipment, maintenance) for publication and distribution of DSWA's scientific and technical reports.

Counterproliferation ($2,070K)

Complete validation of Advanced Numerical Methods. Compare results to precision test data.

Perform large-scale analysis of incendiary warheads to support demonstration testing.

Continue to provide centralized CRAY resources in support of counterforce portion of Counterproliferation ACTD.

Continue DATACOM computational support by providing wide area connections in support of counterforce portion of Counterproliferation ACTD.

Weapon/Target Interaction ($200K)

Transition "new explosive" fabrication technology to U.S. contractors, DoD and DOE labs.

Transition "convective burning" to the DSWA gun development programs.

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Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment

The United States and its allies face a growing threat related to critical military targets hidden within and shielded by hardened, deeply buried tunnel complexes which house battle management facilities, command, control, and communications facilities, theater ballistic missiles and their transporter-erector-launchers (TELs), and biological/chemical/nuclear weapons production or storage facilities. An objective of this program is to examine the existing U.S. and Allied capabilities to hold hardened, deeply buried tunnel targets at risk, thereby defining a current performance baseline. Any deficiencies will be identified and the ability of planned systems to address these deficiencies will be assessed. Finally, new technologies needed to mitigate remaining shortfalls will be evaluated as candidates for new hard target defeat acquisitions. Activities respond to priorities by the Office of the Under Secretary of Defense for Acquisition and Technology (OUSD(A&T)) Hard and Deeply Buried Target Defeat Capability Initiative and U.S. Forces, Korea. Efforts in this program provide part of the technology base needed for counterproliferation activities conducted in other DoD programs.

The Presidential Decision Directive (PDD) on Stockpile Stewardship implemented an indefinite moratorium on underground nuclear testing while requiring retention of the capability to resume testing at Presidential direction. DSWA has complied with this policy by realigning the previously existing underground test program to emphasize non-nuclear weapons test technology and facility development, and to conduct a program for an orderly decommissioning and mothballing of the national underground nuclear test assets. The following major tasks will satisfy this requirement: (1) continue test complex shutdown, continue tunnel stabilization and preservation; (2) continue environmental characterization; (3) document testbed design and construction methodology; (4) maintain UGT readiness through joint test organization activities at NTS including counterproliferation and hard target defeat testing; and (5) support SOCOM efforts to develop tactics and techniques for JCS Joint Warfighter Capabilities of Discriminate Attack and Counterproliferation. Project AI is linked to Project AB, through which its testing is conducted, and to Project AC which leverages its weapons work.

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Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment (cont'd)

FY 1996 Accomplishments

Hard Target Tunnel Defeat ($2,000K)

- Compiled a database of Balanced Vulnerability Assessments and began applying the data to the problem of identifying single point vulnerability nodes in underground facilities.
- Supported USD(A&T)'s Hard and Deeply Buried Target Defeat Capability acquisition program with computational support and associated studies of weapon effectiveness assessments for the evaluation of new concepts.
- Performed full-scale tunnel portal tests.
- Began test sequence for hard target kill and functional vulnerability of hard tunnel facilities.

Nevada Test Site Activities ($7,390K)

- Completed test bed documentation; archival of underground testing techniques, procedures, and methodologies; and transfer of appropriate underground test technologies.
- Maintained test site infrastructure for DSWA activities at the Nevada Test Site (NTS) in support of environmental characterization activities and for tunnel decommissioning and site characterization for the last tunnel complex to be closed. One tunnel complex is maintained in support of the program for military exercises on defeat of hardened underground facilities and for the stockpile stewardship program.
- Supported SOCOM research and development training, and tactics development by providing targets, equipment, and personnel.

FY 1997 Plans

Weapon /Target Interaction ($1,958K)

- Complete data survey and geologic characterization of Korean Multiple Rocket Launcher (MRL) sites.
- Continue support for USD(A&T)'s Hard and Deeply Buried Target Defeat Capability program.
- Complete lab-scale portal damage tests on intact rock.

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Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment (cont'd)

Bomb Damage Assessment ($500K)

Develop an automated engineering tool to identify and exploit vulnerable nodes in underground facilities. Add module for portal and tunnel damage (based on tunnel portal test data).

Continue compiling a database of Balanced Survivability Assessments and began applying the data to the problem of identifying vulnerable nodes in underground facilities.

Test and Simulation ($2,690K)

Maintain DSWA activities at NTS in support of environmental remediation activities.

Provide on-site DSWA personnel to plan and supervise environmental remediation of DSWA facilities using Defense Environmental Restoration Account funds.

Maintain one tunnel complex in support of the stockpile stewardship program.

Complete lab-scale penetration tests on intact rock in support of phenomenology/validation tests.

Perform phenomenology tests on tunnel deformation in jointed rock.

Complete tests on unlined and lined tunnels in Norway geology.

Evaluate weapon/target interactions for new weapons concepts, enhanced payloads, and target fragility.

Continue test sequence for hard target kill and functional vulnerability of hard tunnel facilities.

Continue supporting SOCOM training and tactics development by providing targets, equipment and personnel.

Begin construction of two missile tunnel facility test tunnels.

FY 1998 Plans

Weapon/Target Interaction ($4,493K)

Develop geoengineering models describing key aspects of geology pertaining to warhead penetration and damage propagation.

Enhance the MEA tunnel module by adding subroutines for improved target geology, penetration models, and subsystem damage.

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Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment (cont'd)

Continue support for USD(A&T)'s Hard and Deeply Buried Target Defeat Capability program.
Evaluate weapon/target interactions for new weapons concepts, enhanced payloads, and target fragility.
Complete field tests on blast/fragmentation/fire damage to target subsystems, including blast doors, vehicles, and equipment.
Collect and evaluate target and event signatures for surveillance.

Bomb Damage Assessment ($500K)

Complete the automated engineering tool to identify and exploit vulnerable nodes in underground facilities.
Begin evaluation of target reconstitution, post-attack.

Test and Simulation ($4,719K)

Maintain DSWA activities at NTS in support of environmental remediation activities.
Provide on-site DSWA personnel to evaluate environmental remediation requirements of DSWA facilities.
Maintain one tunnel complex in support of the stockpile stewardship program.
Conduct tunnel construction/test support exercises.
Perform tests and demonstration for functional kill of operational hard tunnel facilities.
Continue test sequence for hard target kill and functional vulnerability of hard tunnel facilities.
Complete construction of a missile tunnel facility test tunnel.

FY 1999 Plans

Weapon/Target Interaction ($4,687K)

Continue support for USD(A&T)'s Hard and Deeply Buried Target Defeat Capability program.
Evaluate weapon/target interactions for new weapons concepts, enhanced payloads, and target fragility.
Collect and evaluate target and event signatures for surveillance.
Begin planning activities for C3I tunnel target.

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Project AI - Hard Target/Tunnel Defeat & Nevada Test Site (NTS) Sustainment (cont'd)

Bomb Damage Assessment ($500K)

Continue target reconstitution studies and model development for incorporation in MEA tunnel module.

Test and Simulation ($5,240K)

Continue NTS infrastructure maintenance by maintaining DSWA activities at NTS in support of environmental remediation activities.

Continue providing on-site DSWA personnel to evaluate environmental remediation requirements of DSWA facilities.

Maintain one tunnel complex in support of the stockpile stewardship program.

Begin tunnel construction/test support activities and perform tests for functional kill of hard tunnel facilities housing production or storage of Weapons of Mass Destruction.

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Project AM - Combating Terrorism - Terrorism has been an international problem for many years, but recent events have greatly increased the awareness of the domestic vulnerabilities to terrorism. The World Trade Center, Oklahoma City, and Saudi bombings have vividly illustrated the immediacy of the threat and the necessity that the U.S. be better prepared to prevent and respond to them. The extensive data base and expertise on nuclear and conventional weapons effects acquired over the last fifty years by the Defense Special Weapons Agency (DSWA) constitute a unique foundation for predicting the explosive environments due to blast effects as a basis for forensic investigations. The creation of this project reflects the Congressional intent to adapt and make available DSWA technology and expertise to reduce the vulnerability of U.S. forces and infrastructure to terrorist events and enhance the capabilities of U.S. law enforcement authorities. Research in this area supports the JCS Joint Warfighter Capability of Counterproliferation.

FY 1996 Accomplishments

Threat analysis and vulnerability baseline ($400K)

- Assessed the range of threats (explosives configuration and constituents) likely to be encountered in the U.S.
- Summarized the assessment in a data base which includes the characterization and classification of the vulnerabilities of major civilian and government resources.
- Assessed vulnerability of one major civilian and one major military facility with significant potential for being targeted by terrorists.

Predictive modeling assessment, adaptation, and validation ($3,600K)

- Initiated efforts to quantify response of selected structural components to explosive effects and define potential retrofit and design mitigating techniques for force protection and facility vulnerability reduction.
- Initiated efforts to quantify explosives of advanced terrorist devices, such as incendiaries and weapons of mass destruction-laced explosives.
- Began adapting structural response models to address terrorist-type explosions.

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Project AM - Combating Terrorism (cont'd)

FY 1997 Plans

Vulnerability assessment and mitigation ($2,498K)

Assess vulnerability of representative structures to support development of a generalized vulnerability assessment methodology.

Conduct terrorist-based event exercises to define exercise support requirements and develop assessment and predictive tools.

Explosive effects and mitigation ($4,000K)

Characterize explosives behavior in wet and dry geologies and incorporate data into response models.

Initiate design of full-scale validation test facility.

Characterize generation of debris due to blast and shock.

Evaluate effectiveness of retrofit techniques for mitigating blast and shock.

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Project AN - Thermionics - Meeting national objectives in both the military and civilian areas will require large capacity (40-100kW) nuclear space power systems having long lifetimes. Potential applications have been identified by the Air Force and NASA. The Air Force "New World Vistas" study, dated 15 December 1995, cites specific requirements for space nuclear power to accomplish force projection from space. NASA has identified requirements for power and propulsion for contemplated deep space missions and manned exploration. The objectives of DSWA's Advanced Thermionics Program are to advance the state of the art of thermionic power conversion in the United States, to develop high performance and highly reliable thermionic converters that provide high output power per unit of system mass, to demonstrate the capabilities of these thermionic converters, to show their feasibility for use in thermionic systems, and to develop corresponding system level conceptual designs. This effort supports the Defense Technology Area Plan for Space Platforms.

FY 1996 Accomplishments

Integrated Solar Upper Stage (ISUS) ($3,800K)

Leveraged USAF Phillips Laboratory ISUS Program to procure the most advanced U.S. planar thermionic converters, and evaluate their performance in an Engine Ground Demonstration.

In-core Thermionic Development ($3,700K)

Released Ready for Proposal (RFP) to design, fabricate, and test high performance and highly reliable in-core thermionic converters.

Solar or Out-of-Core Thermionic Development ($1,900K)

Released RFP to design, fabricate, and test high performance and highly reliable solar or out-of-core thermionic converters.

Microminiature Thermionic Converters (MTCs) ($600K)

Awarded Interagency Cost Reimbursement Order (IACRO) to Sandia National Laboratories to fabricate and test MTCs with high conversion efficiency using semiconducter integrated circuit fabrication methods.

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Project AN - Thermionics (cont'd)

FY 1997 Plans ($3,000K)

In-core Thermionic Development ($1,800K)

- Award contract
- Fabricate diodes
- Demonstrate diode performance

Solar or Out-of-Core Thermionic Development ($600K)

- Award contract
- Fabricate diodes
- Demonstrate diode performance

Microminiature Thermionic Converters ($600K)

- Deliver and test converter with 5 micrometer gaps
- Deliver and test converter with 3 micrometer gaps
- Test array of microminiature converters

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Project AQ - Deep Digger - This project proposes to develop a "Deep Digger" design for attacking hard targets such as leadership or C3 Bunkers, underground factories, or weapon storage facilities. The U.S. Services have identified a need to defeat such hard and buried targets. Current weapons have only limited capability against these targets. A more effective penetrator capability such as that claimed by the inventor of "Deep Digger" is required.

This effort is responsive to Special Operations Forces interests as well as the consolidated Mission Need Statement of the U.S. Air Force Combat Command and the U.S. Strategic Command. The deep digger system would be delivered by a guided munition airframe such as used by the Air Force and the Navy. As an integrated weapon, this concept has application as a breeching tool.

FY 1997 Plans

Technology Development ($2,000K)

Develop a detailed description of the digger concept.
Develop a risk reduction experimental plan.
Support expert panel review with in-depth analysis and experiments.
Produce a concept development plan for a follow-on action.

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Project AR - Johnston Atoll Remediation - DSWA is currently managing the environmental restoration of a 24-acre site on Johnston Island which is contaminated with plutonium from atmospheric nuclear weapon missile aborts in 1962. The technology developed and used by DSWA over the years is demonstrably successful; in two more years the volume of contaminated soil (dredged, filled, and compacted coral) will be reduced from 180,000 metric tons to 29,000 metric tons. That technology is reaching the limits of its effectiveness, and an additional process, yet to be identified, is necessary to further reduce the volume. The clean portion of the soil is available for use on Johnston Atoll. DSWA plans to dispose of the waste at the Nevada Test Site. With removal of the waste from Johnston Atoll, the 24-acre site can be returned to unrestricted use. At a current cost of $1.0 million per thousand metric tons of waste, the expense of shipping and disposing of the remaining low-level radioactive waste mandates that it be the smallest volume attainable.

To that end, DSWA has undertaken a program to identify and employ an innovative waste-reduction technology (or combination of technologies) to reduce the volume of waste to a manageable and less-expensive 5,000 metric tons. Through a series of vendor bench-scale and pilot-scale technology demonstrations with the support of the Department of Energy facilities at the Nevada Test Site, DSWA hopes to identify or develop in 1997 an effective technology that can be scaled up to meet the unique conditions at Johnston Atoll.

FY 1997 Plans

Technology Development ($2,000K)

Identify, develop and employ a waste-reduction technology

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Project AX - TOPAZ International Program - The TOPAZ International Program was the only U.S. space nuclear reactor technology program. Restructured in FY96, it focused on transferring advanced Russian space nuclear power piecepart and component level technologies to the United States. This program emphasized obtaining state-of-the-art Russian thermionic hardware and fabrication processes and ensuring that those processes were well understood by U.S. scientists and engineers. The House and Senate Defense Authorization committees did not support the FY 97 budget request and have terminated the TOPAZ International Program.

FY 1996 Accomplishments

Technology Transfer ($8,500K)

- Negotiated and signed the first contracts between the U.S. DoD and Russian Institutes for space nuclear reactor power technologies.
- Developed design for 60 kilowatt-class single-cell thermionic fuel element (TFE).
- Completed study of 40 kilowatt class experimental TFE.
- Prepared system and initiated tests of startup system interactions with an external, diffusion cesium reservoir.
- Completed National Academy of Sciences review of program.

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Project AY - Bioenvironmental Hazards Research - This project provides for research on bioenvironmental hazards of specific DoD concern. Areas of research include remediation, human health effects and risk evaluation, pollution prevention, waste stream treatment, and impact assessment of atmospheric emissions. Funds were provided as a Congressional addition in FY 1994, FY 1995 and FY 1997, and were intended to continue efforts begun by a grant in FY 1989 to Tulane and Xavier Universities. Additional funding was made available from existing DSWA resources to comply with Congressional direction to continue this effort in FY 1996.

FY 1996 Accomplishment ($5,000K)
The research emphasized the impact of environmental pollutants on human and ecological systems. Priority was given to pollutants of particular concern to the defense community such as radioactive material, and agents associated with chemical and biological defense. Research will include disposal, detection, storage, separation, decomposition (bioremediation) and environmental hazards. Work has not yet begun due to late release of FY 1996 funds from OSD. Award of grant is anticipated before September 1997.

FY 1997 Plans ($5,000)
Efforts anticipated from the FY 1997 budget appropriation will continue to follow the intent of the original program by supporting a collaborative research program which develops a better understanding of the effects of bionevironmental hazards of pollutants on the human and ecological systems. Of particular concern is research which may reveal possible synergistic effects of pollutants on organisms and ecosystems.

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B. Program Change Summary

	FY96	FY97	FY98	FY99
Previous President's Budget	228.0	195.1	212.6	222.7
Current Budget Submit/President's Budget	227.3	192.3	212.0	221.7

Change Summary Explanation:

The budget request supports a refocused program strategy. In light of the recent Defense Authorization Conferees' decision to terminate the TOPAZ International Program, funds have been redistributed in support of DSWA's commitment to the sustainment of nuclear competencies, and the high priority Electro-Thermal Chemical gun advanced technology program.

C. Other Program Funding Summary None.

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AB (Test & Simulation Technology)																
Acquisition Milestones																
Initiate radiation simulator diagonostics			X		X								X			
Begin Decade quad					X											
Initiate large area debris shield development									X							
Engineering Milestones																
Design reviews for communications/radar NWE simulators	X	X														
Demonstrate improved soft x-ray sources			X			X				X				X		
Demonstrate improved hot x-ray sources			X			X				X				X		
Demonstrate Pulsed Power Components for NWE			X													
Complete large area debris shields						X										
Demonstrate radiation simulator diagnostics						X				X				X		
Demonstrated insulator lifetime (2X) improvement			X													
T&E Milestones																
Initial Operational Capability of Communications/Radar NWE simulators						X	X									
IOC Non-Ideal Airblast Simulation capability at LBTS			X													
Close Aurora simulator		X														

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D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AB (Test & Simulation Technology)																
Other Program Events																
Complete closure of Blackjack simulators							X									
Complete closure of Phoenix and Casino Simulators							X									
Begin MBS operation at AEDC			X													
Begin Decade Quad checkout at AEDC											X					
Begin Decade customer testing at AEDC															X	
Build 1/2 scale structures for collateral effects & wall-failure testing	X	X														
Execute protective design tests (Dipole Gate)	X															
Execute antipenetration tests	X						X		X		X				X	X X
Execute enhanced warhead tests		X				X				X						
Construct large test structure							X								X	
Construct hard target 3							X									
Initiated Large Blast/Thermal Simulator (LBTS) Final Blast Shock Operational Capability		X														
Integrated thermal test operation into the test capability at LBTS	X															
Executed Army M-1 tank test requirements in LBTS						X										
Executed Navy thermal test requirements at TRS site & Tri Service Facility			X													

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D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AB (Test & Simulation Technology)																
Other Program Events																
Joint DSWA-Army non-ideal blast testing program for LBTS upgrade (P3I)	X	X	X													
Completed fully dynamic display sensor nuclear weapons effects simulator demonstration	X															
Construct AGT Targets		X					X									
Complete Decade Assessment Program		X														
Continue communication/radar atmospheric effects simulator participation in operability assessment/warfighting exercises					X											
Evaluate Upgraded Early Warning Radar (UEWR) operability for NMD						X										
Continue testing of vehicle types for USANCA							X									
Complete RNECS development for TMD and begin initial operational tests										X						
Complete ACS development and begin initial operational test									X							
Evaluate advanced sensor focal planes in NICS											X					
Provide advanced SATCOM Simulation Test Support to assess TMD architecture communications link operability											X					
Evaluate TMD GAR operability												X				
Continue advanced SATCOM Simulation Test Support to MILSTAR and Universal Modem											X	X				
Complete RNECS development for NMD and begin initial operational tests															X	

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D. Schedule Profile

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AB (Test & Simulation Technology)																
Other Program Events																
Develop advanced optical scene generation/projection													X			
Develop mitigation techniques for TMD GBR in a nuclear-disturbed environment																X
Provide advanced SATCOM/UEWR simulation test support to assess NMD architecture operability																X
Continue communications/radar atmospheric effects simulator participation in operability assessment/warfighting exercises													X	X		
Complete evaluation of NMD target acquisition and tracking algorithms against improved NODDS IR scene and evaluate for fusion with RNECS																X
Complete modifications to LBTS for blast and thermal diagnostics															X	

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AC (Weapon Systems Lethality)																
Other Program Events																
Executed tests in Support of the Joint Munitions Effectiveness Manual			X													
Validated adaptive refinements of structural dynamics code			X													
Validated Munitions Effects Assessment			X													
Validate coupled codes							X									
Supported Battle Damage Assessment Sensors/demo			X													
Release weather & transport model			X				X				X				X	
Conducted precision model shock/bubble assessment test		X														
Completed discrete elements structural boundary model			X													
Started Computer Aided Design Interface			X													
Conduct live fire demonstration						X										
Complete advanced fluid/structural codes							X									
Fabricated prototype high energy density capacitors			X													
Design and fabricate full scale high energy density capacitors							X									
Validate Virtual Interactive Target in STOW DIS exercise							X									

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AC (Weapons Systems Lethality)																
Other Program Events																
Support Service/CINC exercises & training with technical support/weapon effects information.					X	X	X	X	X	X	X	X	X	X	X	X
Released graphite reactor simulator	X															
Complete functional facilities defeat analysis							X									
Execute one-third scale single and multiple ground shock experiments									X	X	X	X				
Initiate full-scale low-yield ground shock experiments for hard target defeat																X
Conduct live fire demonstration							X									
Conducted Wind Tunnel Test of Flight Body for 5" Naval Gun		X														
Electromagnetic Sabot-Launched Electric Kinetic Energy (SLEKE) projectile tests for Army							X									
Complete one breadboard flux compression generators							X									
Complete long pulse HPM megawatt class source							X									
Begin joint laboratory tests with U.S. Navy using 10 kW HPM source					X											
Began alternate source development						X										

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AC (Weapons Systems Lethality)																
Other Program Events																
Begin exploration of HPM associated technology for Command and Control Warfare (C^2W)			X													
Execute tests in support of the Joint Munitions Effectiveness Manual							X				X					X
Continue validation of refinements of structural dynamics code							X				X					X
Continue validation of Munitions Effects Assessment Program							X				X					
Validation of second generation targeting tool																X
Initiate field testing of enhanced penetration testing into hard weathered rock							X									
Initiate field testing on closely spaced multiple penetration into hard targets							X									
Complete penetration field testing for penetration into hard weathered granite																X
Completed high energy density materials evaluation.			X													
Scale-up high energy density materials production capability							X									

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AC (Weapons Systems Lethality)																
Other Program Events																
Developed High-Power Radio Frequency (RF) test system, and completed lab demonstration	X															
Began advanced RF source development and continued foreign asset testing	X															
Explored HPM associated technology designed for defense of friendly assets		X														
Begin to explore HPM hardening technology for advanced applications					X											
Conduct static outdoor demonstration of EM effects on weapons systems							X									
Begin Alternate Source Development						X										
Complete long pulse HPM megawatt class source							X									
Conduct modified live-fire outdoor demonstration of EM effects on weapons systems										X						
Develop HPM hardening technology for Command and Control Warfare (C^2W)										X						
Begin to explore HPM associated technology for Command and Control Warfare (C^2W)											X					
Begin to develop advanced long pulse HPM source technology							X									

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D. Schedule Profile (cont'd)

	FY 1996	FY 1997	FY 1998	FY 1999
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Project AC (Weapons Systems Lethality)				
Other Program Events				
Participate in advanced technology demonstration with the Services				X
Complete advanced long pulse HPM source technology				X

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D. Schedule Profile (cont'd)

	FY 1996	FY 1997	FY 1998	FY 1999
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Project AE (Weapon Safety & Operational Support)				
Other Program Events				
Automated Routing & Maintenance System	XXXX	XXXX		
Air vehicle Planning System (APS)		XX	XXXX	XXXX
Synthetic Exercise Environment	XXXX	XXX		
Hazardous Prediction Integration System	X			
Minuteman III Refined	XXXX	XXXX	XXXX	
B52	XXXX	XXXX		
Fuel Fire	XXXX	XXXX	XXXX	XXXX
Propellant Sensitivity	XXXX	XXXX	XXXX	
Fire Resistant Enhancement (Second Phase)	XXXX			
WSSA Designated System		XX	XXXX	XXXX
Ground Based Jammer	XXX			
Navy Aircraft Carrier Defense System	XXXX	XXX		
Survivability Integration Initiated	XXXX	XXX		
Continue survivability integration assessments as tasked by CINCS		X	XXXX	XXXX
Initiate survivability integration demonstration program as follow-on			X	
Laser Countermeasures	XX			
Modeling & Simulation Initiatives	XXXX	XXXX	XXXX	XXXX
NATO Nuclear Planning System PC Trainer	X	XXXX	XXXX	

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D. Schedule Profile (cont'd)

	FY 1996	FY 1997	FY 1998	FY 1999
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Project AE (Weapon Safety & Operational Support)				
Other Program Events				
Automated Nuclear Weapons Training Program	X X X X	X X X X		
Counterproliferation Awareness Course (Development)	X			
Sustaining Nuclear Operational Training Expertise	X X	X X X X		
Air Vehicle Planning System (APS)	X X	X X X X	X X X X	
Nuclear Planning System Target Data Feed	X	X X X X	X X X X	
Conduct Balanced Survivability Assessments	X X	X X X	X X X	X X X
Conduct Integrated Survivability Assessments	X X	X X	X X	X X
Conduct Functional Kill Assessments	X X X X	X X X X	X X X X	X X X X
Strategic Force Planning Initiatives	X X X X	X X X X	X X X X	X X X X

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AF (Weapon Systems Operability)																
Acquisition Milestones																
Delivered design tool analysis capability-based on AGT/UGT radiation testing		X														
Developed and delivered First-of-a-Kind Non-Upsettable System Design Guidelines	X															
Delivered HWIL Testbed for protocol validation		X														
Other Program Events																
Completed anti-emetic drug recommendation for NATO			X													
Joint DSWA-CBDCOM NBC Modeling & Simulation Conference		X														
Operational exposure guidance for potential low level radiation exposure for troops in Bosnia			X													
Support to 1996 Olympic committee EOC for potential CBR incidents	X															
Regional version Consequence Assessment Tool Set							X									
Human variability in Modular Semi-Automated Forces Demonstration							X									
Regional GIS-Based NBC Assessments (PACOM AOR)											X					
Complete Operational Evaluation Group & Equipment Assessment for Low-Level Radiation																X

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AF (Weapon System Operability)																
Other Program Events																
Regional GIS-Based Natural & NBC Hazard Consequence Assessment Tool Set																X
Developed environments models for sensors for TMD & space surveillance system																
- Assessed nuclear operability issues for Space-Based Infrared Research Satellite System Sensor		X														
Developed Executive Level Software (ELS) communications connectivity Program																
- Deliver final version of ELS to STRATCOM							X									
Deliver qualified radiation-hardened 1-megabit SRAM																X
Deliver lower power gate array (1000 gate)																X
Successfully test prototype megabit SRAM														X		
Demonstrate radiation hard SOI analog technology															X	
Demonstrate radiation-hard 16-megabit SRAM technology																X
Correlate AGT and UGT data for Electronic Systems in a configuration-controlled electronics database						X										
Develop and deliver Preliminary Guidelines for Improved Testable Hardware Testing		X														
Deliver first combined correlation study of optical materials							X									

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AF (Weapon System Operability)																
Other Program Events																
Design preliminary test coupon for optical coating			X													
Develop & deliver First-of-a-Kind testing Technology for High Throughput Sensor System			X													
Complete initial analyses of the communications and radar functions for the end-to-end evaluation of NMD elements/architectures							X									
Begin testing of spacecraft, missile, and sensor demonstration test objects for validation of design and test protocols						X										
Demonstrate software solutions to minimize radiation effects on systems operability							X									
Complete AGT testing and evaluation of materials for correlation with UGT data								X								
Develop optical material test coupons to identify the relationship of design specification to material response for protocol development								X								
Conduct combined effects testing of optical elements to resolve protocol issues.								X								
Evaluate the end-to-end operability of NMD architectures/elements in nuclear-disturbed environment							X									

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AF (Weapon System Operability)																
Other Program Events																
Evaluate the vulnerability of systems and C4I nodes exposed to a nuclear-disturbed environment					X											
Continue assessment and testing of critical fixed-ground-based C4I facilities						X										
Correlate material testing data to predict system-level performance										X						
Develop AGT/UGT threat correlation derived from the completed materials data sets									X							
Develop structural response data for missiles, penetration aids and reentry vehicles from UGT and data											X					
Upgrade testable hardware protocols based on validation testing of sensor subsystems in nuclear environments											X					
Finalize spacecraft missile design and test protocols											X					
Continue analyses of the communications and radar functions for the end-to-end evaluation of the NMD elements/system														X		
Support continuing operational analysis of BMDO radars in nuclear environments														X		
Finalize configuration control electronics database for qualification testing														X		

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AF (Weapon System Operability)																
Other Program Events																
Develop design protocols for advanced optical systems																X
Complete AGT/UGT threat correlation for penetration aids, missile and reentry vehicle materials/structures																X
Finalize sensor design and test protocols and upgrade protocols based on combined effects environments															X	
Finalize sensor design and test protocols and evaluate spacecraft and missile interceptor test protocols																X
Evaluate the end-to-end operability of advanced architectures/networks in nuclear-disturbed environments														X		
Developed program to advance state-of-the-art in EMP/HPM hardening technology			X													
Assess/implement innovative, low-cost EMP/HPM hardening technology concepts for Service Equipment survivability						X										
Develop PC-based EM protection tool							X									
Demonstrate affordable EMP/HPM design and test technologies, develop system hardening technology against advanced HPM techniques, and continue assessment and testing of critical fixed-ground-based C4I facilities										X						
Create EMP/HPM hardening cost modeling tool											X					

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D. Schedule Profile (cont'd)

	FY 1996	FY 1997	FY 1998	FY 1999
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Project AF (Weapon System Operability)				
Other Program Events				
Continue application of innovative, low-cost EMP/HPM hardening technology and propose candidate EM standards and guidelines in accordance with the new technology				X
Incorporate a ground-based radar model for TMD Program	X			
Support cost performance tradeoffs for sensor operability issues for SBIRS in a nuclear environment	X	XXXX	XXXX	XXXX
Develop Beta version of NucSim engagement level phenomenology module	X	XXXX		
Analyze communication and radar systems for end-to-end evaluation of NMD elements and architecture	X	XXXX	XXXX	XXXX
Support operational analysis of BMDO radars in nuclear environments	X	XXXX	XXXX	XXXX
Develop initial ISM	XXXX	XXXX	XXXX	XXXX
Implement detailed communication link simulation and cooperative engagement control into DSWA version of the Army's SPIET	X	XXXX	XXXX	XXXX

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AG (Scientific Computations & Information Systems)																
Other Program Events																
Disseminate Science and Technology Digest	X				X	X				X	X		X		X	X
Data archival incremental deliveries			X				X					X				X
DARE data loading	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Disseminate Computational Aids	X		X			X						X				X
Disseminate "Effects of Nuclear Weapons"											X					
Provide supercomputing resources to researchers	X	X	X	X	X	X	X	X								
Migration to new supercomputing facility					X	X	X	X								
Upgrade tail circuits/hubsite	X		X			X			X					X		
Upgrade peripheral hardware		X	X		X		X			X				X		X
Distributed NATO version of Effects Manual-1	X															
Distribute Effects Manual-1 Technical Handbook						X										

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project AI (Hard Target Tunnel Defeat & NTS Sustainment)																
Other Program Events																
Construct Tunnel Target Test Facility						X	X	X		X	X	X	X			
Characterize Tunnel Target Test Facility							X	X		X	X	X				
Conduct Explosive Safety Tests							X				X					
Equipment Installation															X	X
Conduct Dipole Hail Tunnel Vulnerability Tests		X	X		X					X		X				
Conduct Attack Planning						X										
Conduct Portal Damage Tests U16a						X	X	X							X	X
Conduct Portal Closure Tests U12u							X			X		X				
Conduct Operational Vulnerability Tests		X					X									X

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997			
	1	2	3	4	1	2	3	4
Project AM - (Combating Terrorism)								
Other Program Events								
Assessed threats		X						
Summarized assessment			X					
Cataloged and assessed existing models	X							
Adapted/applied selected tests			X					
Conducted selected tests			X					
Initiated structural component testing			X					
Completed initial component testing							X	
Complete sub-scale wet and dry geology characterizations						X		
Complete selected vulnerability assessments						X		
Develop prototype assessment methodology							X	
Conduct terrorist-based event exercise(s)						X		
Define full-scale validation test requirements								X
Characterize debris hazards						X		
Test selected retrofit techniques						X		

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D. Schedule Profile (cont'd)

	FY 1996				FY 1997			
	1	2	3	4	1	2	3	4
Project AN - (Thermionics)								
In and Out-of-Core RFPs released				X				
In and Out-of-Core contracts awarded					X			
In-core converter designed						X		
Out-of-Core converter designed						X		
First Microminiature converter tested						X		
ISUS EGD Test						X		
ISUS converter coating optimized						X		

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D. Schedule Profile (cont'd)

	FY 1997 1 2 3 4
Project AQ - (Deep Digger)	
Concept Definition	X
Experimental Test Plan	X

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D. Schedule Profile (cont'd)

	FY 1997 1 2 3 4
Project AR - (Johnston Atoll Remediation)	
Technology demonstrations at NTS	X X
Evaluations/vendor selection	X
Develop/award pilot scale contracts	X
Develop/award Corps of Engineers contract for tech/field support at JA	X

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D. Schedule Profile (cont'd)

	FY 1997 1 2 3 4
Project AY - (Bioenvironmental Hazards)	
Broad Area Announcement	X
Collect Proposals	X X
Award Grant	X
Oversight of Research	X

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APPROPRIATION/BUDGET ACTIVITY **RDT&E, Defense-Wide/Advanced Technology Development - BA3**						R-1 ITEM NOMENCLATURE **Verification Technology Demonstration; 0603711H**				
COST *(In Millions)*	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	Cost to Complete	Cost to Complete
Total 0603711H Cost	32.3	25.5	81.4	50.2	43.8	43.0	43.6	44.5	Continuing	
Project CA Strategic Arms Control Technology	10.6	8.2	8.1	9.4	10.2	11.4	11.6	11.9	Continuing	
Project CB Conventional Arms Control Technology	10.6	10.2	9.5	8.1	8.1	8.3	8.4	8.7	Continuing	
Project CC Chemical Weapons Convention	11.1	7.2	9.5	10.8	10.7	12.9	13.2	13.4	Continuing	
Project CD Nuclear Arms Control Technology			54.3	21.9	14.8	10.4	10.4	10.5	Continuing	

A. Mission Description and Budget Item Justification - This Defense Special Weapons Agency (DSWA) program element covers implementation, compliance, monitoring and inspection, research development test and evaluation (RDT&E) for existing and emerging arms control treaties and agreements. The funded projects conform to requirements presented and approved by the Office of the Under Secretary of Defense (Acquisition & Technology) through the DoD Arms Control Requirements Assessment Board (RAB) process. RDT&E fulfills the technical requirements to implement, comply with, and monitor the following treaties/agreements: the Treaty on the Reduction and Limitation of Strategic Offensive Arms (START); the Treaty on Further Reduction and Limitation of Strategic Offensive Arms (START II) (START III); the Anti-Ballistic Missile (ABM) Treaty, the Intermediate-Range Nuclear Forces (INF) Treaty; the Conventional Armed Forces in Europe (CFE) Treaty; the Open Skies (OS) Treaty; the Convention on Certain Conventional Weapons (CCW); the Chemical Weapons Convention (CWC); Comprehensive Test Ban Treaty (CTBT); the CFE Adaptation negotiations, the Anti-Personnel landmine negotiation; Presidential arms control initiatives; and other existing and emerging arms control related agreements, treaties, and initiatives, such as the United Nation's (UN) Transparency in Armaments; the

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Verification Technology Demonstration; 0603711H

Mission Description and Budget Item Justification (cont'd) - Organization on Security and Cooperation in Europe's Vienna Document 94 (VD-94) and the Global Exchange of Military Information (GEMI); Missile Technology Control Regime (MTCR) and the UN's Transparency in Armaments Agreement. It also provides confidence and transparency building capabilities to support DoD efforts concerning the Biological Weapons Convention (BWC), and conforms to the Administration's research and development priorities as related to both conventional arms control and weapons of mass destruction arms control, and disarmament. Arms control technologies are critical for enabling the U.S. to detect, monitor, verify and implement international arms control treaties and other agreements whose purpose is to prevent the proliferation and or reduction of nuclear, chemical, biological, and other advanced conventional weapons. Technical assessments are made to provide the basis for sound project development, to evaluate existing programs, and to provide the data required to make compliance judgments. Technology developments and system improvements projects are conducted to ensure that capabilities to monitor, comply with, and implement treaties and agreements are available when required.

The program includes development of equipment and procedures for data exchanges, on-site and aerial inspections and monitoring, and other confidence-building measures. In addition, assistance is provided to the Office of the Secretary of Defense by providing technical support in preparing for U.S. compliance with treaty obligations. For example, work includes an assessment to determine the susceptibility of a CTBT verification regime to evasive measures. Results will be used by the CTBT negotiators to develop a technically robust International Monitoring System (IMS). Hardware and procedures developed are often transitioned to the On-Site Inspection Agency (OSIA), or appropriate international inspectorate, as in the case of the CWC, for use in conducting treaty mandated inspection and monitoring and for implementing transparency and confidence-building regimes. Where applicable, RDT&E to meet requirements in one treaty area is applied to fulfill requirements in other areas to eliminate duplication of efforts. For example, development of remote monitoring capabilities for future START Treaty applications will also be evaluated for use to verify limits and activities in a future conventional arms control regime. The technologies and procedures developed in DSWA's arms control technology program provided an invaluable source of information on equipment and procedures that was extensively used by a DSWA team to support an interagency assessment of Long Term Monitoring of Iraq. The results of the effort and equipment developed in the DSWA program are being used to implement the provisions of United Nations Resolution 715.

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Mission Description and Budget Item Justification (cont'd) - DSWA's synergistic approach to fulfilling arms control requirements has been maximized in data management development. Arms control treaties require extensive exchanges of data concerning treaty accountable items, initial declarations, movements, etc., by signatory nations. DSWA has developed a treaty information management system, the Compliance Monitoring and Tracking System (CMTS), to accommodate these data exchanges and monitor U.S. compliance with treaty data reporting provisions. The CMTS provides treaty required data exchanges for INF, START, CFE and Confidence- and Security-Building Measures. A DoD system, Chemical Accountability Management Information Network (CAMIN), is under development to create the capability to transmit CWC required data. The Open Skies Notification System (OSNS) is being developed to support an anticipated FY1997 treaty entry-into-force (EIF). DSWA will transition operational control of the CMTS to OSIA in a phased approach starting with Data Management/Notification System (DMNS) and START Central Data System (SCDS) in FY1997. The Chemical Weapons Convention Information Management System (CWCIMS) was offered to the Preparatory Commission at the Hague by the United States Government (USG). The Commission accepted the U.S. offer and the system was delivered in late FY1996.

In FY 1998 and FY 1999, the architecture for presentation/execution of this program will change. Elimination and realignment of the Implementation and Compliance (I&C) category resulted in all negotiation, compliance, and implementation efforts moving to the Technical Assessments category. All hardware and software developments in I&C have moved to the Technology Development or Improvements category to reflect the actual nature of the effort.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Verification Technology Demonstration; 0603711H

Project CA - Strategic Arms Control Technology - This project consists of research development test and evaluation (RDT&E) activities required to provide the capabilities needed to conduct monitoring, inspections, and data exchanges under the Strategic Arms Reduction Treaty (START), START II, START III, Missile Technology Control Regime (MTCR), Safeguards, Transparency and Irreversibility (STI) Agreement, Anti-Ballistic Missile (ABM) Treaty, and the Intermediate-Range Nuclear Forces (INF) Treaty. It also assists the United States Government (USG) and industry in compliance with the treaties and development of technology to meet requirements of future strategic arms control agreements. The projects conform to requirements presented and approved by the Office of the Under Secretary of Defense (Acquisition & Technology), (OUSD(A&T)), through the DoD Arms Control Requirements Assessment Board (RAB) process. The START Central Data System (SCDS), as part of the Compliance Monitoring and Tracking System (CMTS), enables the U.S. to generate treaty-required notifications, perform treaty compliance assessments, and transmit notifications to treaty states. The START II Treaty, signed in January 1993, requires inspections of converted SS-18 silos and authorizes additional re-entry vehicle on-site inspections of Intercontinental Ballistic Missiles (ICBMs) installed in the converted silos. It also introduces new rules for counting strategic forces that complicate START reporting. Tools developed by this program will enable the USG to effectively exercise treaty inspection rights and monitor compliance and reporting. Technology development efforts are planned to support anticipated future treaty requirements in the most non-intrusive and cost-effective manner. Future strategic arms control regimes may consider non-deployed missiles and warheads in all phases, to include conversion and/or elimination, and would require the development of new procedures and equipment to accomplish the monitoring task. The primary focus of the efforts is on more effective methods of measuring characteristic Treaty Limited Item (TLI) signatures with technologies such as gravity gradiometry and providing monitoring/inspection capabilities to ultimately reduce cost and increase the flexibility of U.S. inspectors.

Overall RDT&E requirements and implementation timelines are dependent on the desired robustness and implementation schedule for the various components of the verification regime. RDT&E is being initiated now to ensure that monitoring and inspection systems are available at treaty entry into force (EIF) and that negotiators have the technical information to make informed decisions on key issues. This project descriptive plan supports the JCS Warfighting Capability of counterproliferation.

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Project CA - Strategic Arms Control Technology (cont'd) -

FY 1996 Accomplishments

Implementation and Compliance ($5.2M)

- Continued SCDS START development and testing with software release 4.3 to satisfy treaty requirements.
- Prepared to incorporate START II data reporting requirements into CMTS SCDS.
- Provided treaty compliance assessments and planning support to OUSD(A&T)/Arms Control Implementation & Compliance (ACI&C).
- Provided technical and engineering support to START Treaty Joint Compliance and Inspection Commissions (JCIC).
- Completed analysis of legal implications for START Special Access Visit (SAV) for government and industry.
- Initiated effort on tracking Radionuclide Atmospheric Plumes.
- Conducted impact analyses of proposed provisions for on-site activities and associated measures for CTBT for confidence-building.

Technical Assessments ($1.3M)

- Completed Technical On-Site Inspection (TOSI) closeout/transfer of control.
- Conducted ABM/Theater Missile Defense (TMD) interceptor technical assessment to identify modeling tools and model performance criteria.
- Conducted TLI detection, identification and tracking assessment.
- Continued assessments of proposed International Monitoring Systems for CTBT (via adversarial analysis methodology).
- Initiated strategic weapons and materials monitoring assessments to support post-START II requirements to monitor mobile delivery systems, non-deployed nuclear weapons systems and warhead inventories.

Improvements ($.8M)

- Continued development of a remote, unattended, corral monitoring system to supplement on-site inspections.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Verification Technology Demonstration; 0603711H

Project CA - Strategic Arms Control Technology (cont'd) -

Technology Development ($3.3M)

- Completed development of the Authenticated Tracking Monitoring and Tracking System.
- Conducted Advanced Technology Development Program (Light-Weight Neutron Detector, Micro-power Impulse Radar, Underground Facility, Modeling, Raman Lidar, Multifunction Synthetic Aperture Radar and Object Pattern Recognition) with national laboratories and university research institutes.
- Completed fabrication and factory test of an arms control verification gravity gradiometer in preparation for field trials in an outdoor environment.
- Initiated gravity gradiometer modeling and simulation and independent assessment to support field trials.

FY 1997 Plans

Implementation and Compliance ($4.0M)

- Complete CMTS SCDS documentation and transition system to the On Site Inspection Agency (OSIA).
- Incorporate future START/START II follow-on treaties data exchange revisions into CMTS.
- Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
- Provide technical and engineering support to START Treaty commissions (JCIC/BIC).

Technical Assessments ($.3M)

- Complete strategic weapons and materials monitoring assessment to support post-START II requirements to monitor mobile delivery systems, non-deployed nuclear weapons and delivery systems, and warhead inventories.

Technology Development ($3.9M)

- Conduct and complete prototype gravity gradiometer system field trials and technical data package.
- Conduct and complete gravity gradiometer modeling and simulation data verification analysis.
- Initiate development of an Object Pattern Recognition prototype including motion detection.

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Project CA - Strategic Arms Control Technology (cont'd) -

Complete Corral Monitoring System (CMS) prototype and system documentation.
Initiate modification/enhancement/development of ABM/TMD computer analysis models.
Initiate system concept, design concept, and prototype technology development for detection, identification, and tracking of ABM treaty related TLI's.
Initiate "warhead fingerprinting" capability analysis of Multiplicity Fingerprint Detector, Rapid Identification System, and Nuclear Weapon Identification System technologies at national laboratories.
Initiate new approaches for Wide Area Tracking System (WATS) to detect nuclear weapons and dispersal devices transported on land.

FY 1998 Plans

Technical Assessments ($2.4M)

Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
Provide technical and engineering support to START Treaty commissions (JCIC/BIC).
Continue research on technologies to support post-START II requirements to monitor mobile delivery systems, non-deployed nuclear weapons and delivery systems, and warhead inventories.

Technology Development ($5.7M)

Incorporate post-START II software modifications to support CMTS interface with international data exchange formatting.
Complete Object Pattern Recognition prototype development.
Continue modification/enhancement/development of ABM/TMD computer analysis models.
Initiate Emerging Technologies investigations for future treaty requirements through industry, academia and national laboratories.
Initiate Authenticated Tracking and Monitoring System (ATMS) proof of concept demonstration an a Russian MINATOM railcar.

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Project CA - Strategic Arms Control Technology (cont'd) -

Continue system design and prototype technology development for detection, identification, and tracking of ABM treaty related TLIs.

Complete WATS to detect nuclear weapons and dispersal devices transported on land.

Continue Advanced Technology Development program with national laboratories and university research institutions.

Demonstrate CMS capabilities in an operational scenario.

Select promising "Fingerprinting technologies" for vulnerability analysis and further development.

FY 1999 Plans

Technical Assessments ($2.5M)

Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.

Provide technical and engineering support to START Treaty commissions (JCIC/BIC).

Continue research on technologies to support post-START II requirements to monitor mobile delivery systems, non-deployed nuclear weapons and delivery systems, and warhead inventories.

Technology Development ($6.9M)

Incorporate provisions for post-START II. nuclear warhead and non-deployed TLI data incorporation (and hardware improvements) into CMTS.

Initiate remote monitoring prototype development systems.

Continue Object Pattern Recognition prototype development.

Continue modification/enhancement/development of ABM/TMD computer analysis models.

Continue system design and prototype technology development for detection, identification, and tracking of ABM treaty related TLIs.

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Project CA - Strategic Arms Control Technology (cont'd) -

Continue Advanced Technology Development program with national laboratories and University Research institutions.
Initiate Arms Control Verification Treaty Information System development.
Demonstrate proof of concept for selected "fingerprinting technologies" to support START II follow-on.
Provide follow-on support to WATS O'Conus installation.
Initiate Emerging Technology investigations for future treaty requirements through industry, academia and national laboratories.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1997
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Verification Technology Demonstration; 0603711H

CB - Conventional Arms Control Technology - This project covers Research Development Test & Evaluation (RDT&E) required to: meet on-site and aerial monitoring, transparency, confidence-building, and peacekeeping monitoring technology requirements for existing, emerging, and potential treaties, agreements, and initiatives related to Conventional Arms Control (CAC) and compliance monitoring of peacekeeping regimes; ensure compliance; implement agreements; and provide technical support to negotiations. The funded projects conform to requirements presented and approved by the Office of the Under Secretary of Defense (Acquisition & Technology) through the DoD Arms Control Requirements Assessment Board (RAB) process and described in the Office of the Secretary of Defense (OSD)/Arms Control Implementation and Compliance (ACI&C) Memorandum, dated 12 April 1996, Subject: Guidance and Summary Requirements and ACI&C memorandum, also dated 12 April 1996, Subject: Long Term Planning Guidance. Relevant agreements which require continuing RDT&E support include: (1) the Conventional Armed Forces in Europe (CFE) Treaty, (2) Open Skies (OS) Treaty (projected Entry-Into-Force FY1997); (3) the Organization for Security and Cooperation in Europe (OSCE) Confidence- and Security-Building Measures (CSBMs) contained in Vienna Document 94 (VD-94) to include the Global Exchange of Military Information (GEMI) signed in December 1994 and the OSCE agreements contained in the Lisbon Document of 5 December 1996; (4) the United Nation's Transparency in Armaments (TIA) Agreement established in 1993; and the April 1996 Wassenaar Arrangement on Export Controls for Conventional Arms and Dual Use Goods and Technologies. The RDT&E needs for emerging treaty and agreement areas include: (1) the OSCE Review Conferences, with its OSCE Forum for Security Cooperation (2) the CFE Review Conferences and CFE Adaptation negotiations; (3) regional/sub-regional arms control and peacekeeping to include RDT&E arms control implementation support for the Dayton Agreement and conventional arms proliferation issues; (4) enhancing CSBMs, and (5) the Convention on Certain Conventional Weapons (CCW) and the Anti-Personnel Landmine negotiating the Conference on Disarmament. This project also supports U.S. implementation of and compliance with the decisions of consultative commissions, arms control negotiating and coordinating organizations including: the CFE's Joint Consultative Group; the OSCE's Forum for Security Cooperation; NATO's Verification Coordinating Committee and the High Level Task Force; the Conference on Disarmament; the Multilateral Working Group on Arms Control and Regional Security; the Wassenaar Arrangement; and the Open Skies Consultative Commission.

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CB - Conventional Arms Control Technology (cont'd) - Decisions of all of the negotiating fora and coordinating organizations listed above have resulted and will continue to result in new or revised implementation and compliance requirements to which the U.S. must abide. Further, they all require technical advice and assessments to support U.S. positions and evaluate proposals to ensure DoD equities are protected. New treaty areas not previously addressed include the APL and expanded regional security and peacekeeping monitoring applications. This project descriptive plan supports the JCS Warfighting Capability of counterproliferation.

FY 1996 Accomplishments

Implementation and Compliance ($10.0M)

- Continued OSMAPS transition to users, provided operational support and independent validation and verification.
- Flight tested Synthetic Aperture Radar Open Skies (SAROS) in Open Skies aircraft.
- Delivered SAROS system 2 to U.S. Air Force.
- Delivered portable Synthetic Aperture Radar (SAR) image processing systems.
- Provided treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
- Determined portable/aerial standoff gamma/x-ray detection capabilities.
- At the request of the U.S. Mission to NATO, developed and presented an analysis on the application of technologies to arms control and confidence building implementation and compliance to the NATO Verification Coordinating Committee Seminar with Cooperation Partners.
- Provided technical support to Open Skies Consultative Commission (OSCC), the FY1996 APL negotiations, the Joint Consultative Group, the OSCE's Forum for Security Cooperation, and prepared to support the OSCE Review Conference.
- Supported delivered prototypes, e.g., SAROS, SAR Processing System (SARPRO), Transportable Operational Planning System (TOPS), and Data Annotation, Recording, and Mapping System (DARMS).
- Developed and delivered the Data Management and Reporting System (DMRS) to meet U.S. TIA and GEMI data reporting obligations.

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CB - Conventional Arms Control Technology (cont'd) -

Integrated DMRS in Compliance Monitoring and Tracking System (CMTS).
Provided technical support for standardization of digital data exchange formats for Open Skies data requirements.
Developed U.S. portion of CFE Notification Front End System (NOFES) to comply with international data structures for Nuclear Risk Reduction Center (NRRC) data transmission.
Modified the CMTS DMNS to comply with the newly released (VD-94) CSBM data structures and negotiations on a follow-on international CSBM-NOFES.
Provided support to an international effort to define and develop an Open Skies Data Bank of information.
Completed work as the major leader in an international team to develop and test an Open Skies NOFES system.
Continued analysis of new classes of sensors to support aerial observation regimes.

Technical Assessments ($.5M)

Assessed verification technologies required for emerging or evolving treaty areas such as the CCW-APL negotiation.
Conducted tests of Infra-red targets and flight tests of the Infra-red Line Scanner (AAD-5) for Open Skies implementation and compliance.

Improvements ($.1M)

Completed delivery of an automated Treaty Limited Equipment (TLE) identification training aids system to OSIA.
Delivered DMNS Version 4.3 to meet new U.S. CFE and CSBM (VD-94) obligations and continued independent validation and verification of DMNS software.

FY 1997 Plans

Implementation and Compliance ($8.5M)

Continue delivery of all baseline OSMAPS capabilities, ensure the system complies with all changes to the Open Skies regime and initiate planned modifications.
Continue baseline OSMAPS independent validation and verification.

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CB - Conventional Arms Control Technology (cont'd) -

Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.
Continue support of delivered prototypes, e.g., SAR, SARPRO, TOPS, DARMS, and DMRS.
Provide technical support for SAROS data standardization and implementation of fixed site SAR processor.
Apply a standard digital format to the Open Skies Infra-Red Line Scanner and Video data.
Initiate development of a standard digital format for Open Skies digital sensors data.
Continue assessment of candidate replacement sensor for Open Skies an other aerial monitoring regimes.
Complete development of CFE and CSBM (VD-94) Notification Front End System (NOFES) and integrate it into DMNS.
Initiate update of CMTS to comply with decisions of the OSCE Forum for Security Cooperation and the CFE Review Conference.
Transition operational control of DMNS to OSIA.
Deliver CMTS Version 4.4 and complete CMTS documentation.
Conduct concurrent testing of CMTS compliance updates.
Complete work on an international effort to define and develop an Open Skies Data Bank of information.
Complete and deploy updated CMTS OSNS software to ensure full compliance with Open Skies NOFES formats and concepts.
Continue analyses of new classes of sensors to support aerial observation regimes.

Technical Assessments ($.8M)

Demonstrate proof of concept for selected "fingerprinting technologies" to support START II follow-on.

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CB - Conventional Arms Control Technology (cont'd) -

Provide technical support (to include quick turn around and longer term analyses) to the U.S. delegations to the OSCC, the Joint Consultative Group, the CFE Adaptation negotiation, the Forum for Security Cooperation, the APL negotiation, and regional arms control negotiations and prepare to support the FY1998 OSCE Review Conference.

Test and evaluate a micropower impulse radar for applicability to the implementation of the future or follow-on APL agreement.

Conduct assessments of technologies to support on-going or emerging conventional arms control negotiations (e.g., CCW-APL and CFE Adaptation negotiations.

Conduct technical assessments of regional arms control needs for Central and South America and South Asia.

Technology Development ($.9M)

Develop technologies and prototypes, including the required replacement of the current U.S. OS Infra-Red Line Scanner to ensure U.S. compliance with emerging or evolving arms control requirements.

FY 1998 Plans

Technical Assessments ($5.2M)

Provide technical support (to include quick turn around and longer term analyses) to the U.S. delegations to the OSCC, the Joint Consultative Group and CFE Adaptation, the Forum for Security Cooperation, the APL negotiation, and regional arms control negotiations.

Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.

Conduct assessments of technologies to support on-going or emerging conventional arms control negotiations and peacekeeping requirements for monitoring and complete assessment of APL agreements needs.

Complete technical assessments of regional arms control needs for Central and South America and South Asia.

Continue analysis of new classes of sensors for modification of the Open Skies regime and other aerial observation regimes.

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CB - Conventional Arms Control Technology (cont'd) -

Initiate assessment of the utility of database management and analytical tools for interface with U.S. and international arms control databases.

Document and maintain prototypes to support current and future conventional arms control agreements.

Assess the utility and cost effectiveness of a Universal Treaty Inspection Planning and Execution Tool.

Technology Development ($4.3M)

Continue development of a standard digital format for Open Skies digital sensors data.

Complete planned OSMAPS baseline updates, modifications and independent validation and verification of software.

Complete standardization of Infra-Red Line Scanner and Video data formats.

Initiate prototype development of an inspection planning tool for operational evaluation.

Complete technical support for SAROS.

Continue to develop technologies and prototypes to meet U.S. implementation and compliance requirements.

Initiate development of analytical and database management tools for CMTS.

Conduct concurrent independent validation and verification of the development of CMTS software.

Continue development of replacements for the Open Skies Infra-Red Line Scanner and Video sensors.

FY 1999 Plans

Technical Assessments ($4.3M)

Provide technical support (to include quick turn around and longer term analyses) to the U.S. arms control delegations to the NATO, OSCC, the Joint Consultative Group, the Forum for Security Cooperation, the APL negotiation, and regional arms control negotiations.

Provide treaty compliance assessments and planning support to OUSD(A&T)/ACI&C.

Continue analysis of new classes of sensors for modification of the Open Skies regime and other aerial observation regimes.

Conduct assessments of technologies to support on-going or emerging conventional arms control negotiations.

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CB - Conventional Arms Control Technology (cont'd) -

Conduct technical assessments of regional arms control needs.

Document and maintain prototypes to support current and future conventional arms control agreements.

Technology Development ($3.8M)

Continue to develop compliance block updates for OSMAPS capabilities and perform independent validation and verification.

Initiate the development of an extended digital processor to process digital sensor data to ensure treaty required resolution of foreign sensors used in overflights of the U.S.

Initiate CMTS compliance updates and integration of APL agreement data requirements.

Begin long range development of follow-on technologies to support implementation and compliance with the future APL agreements.

Continue development of database management and analytical tools for CMTS.

Complete development of a prototype universal inspection planning tool.

Continue CMTS independent verification and validation to ensure efficient development of CMTS software.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Verification Technology Demonstration; 0603711H

Project CC - Chemical/Biological Arms Control Technology - This project funds research, development, test and evaluation (RDT&E) necessary to meet DoD requirements for the implementation of chemical and biological arms control agreements and technical analyses to support and protect DoD equities in the negotiation and review of arms control agreements. The primary focus in this project has been and continues to be preparing for multinational verification of, and U.S. compliance with, the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on their Destruction (CWC). States Parties to the CWC undertake a continuing treaty obligation to ensure that the Organization for the Prohibition of Chemical Weapons (OPCW) has the technology to verify compliance with the CWC through the implementation of on-site inspection protocols. This project ensures that technology introduced into the international inspection regime increases the level of confidence in the ability of the inspection process to verify compliance while at the same time minimizing intrusiveness to protect DoD equities. In short, this project provides the U.S. contribution to assist the OPCW in implementing a comprehensive, technically sound inspection program. Technologies developed to support the CWC synergistically support both the U.S.-Russian chemical weapons Bilateral Destruction Agreement and international peacekeeping efforts such as the UN Special Commission on Iraq. In the area of biological weapons arms control, this project provides for technical assessments to assist DoD and U.S. policy makers and negotiators in their efforts to strengthen the Biological Weapons Convention (BWC). These assessments are essential to DoD and U.S. negotiators in the multilateral arena, both in preparation for and subsequent to the BWC Review Conferences (RevCons) held every five years. The RevCons (latest RevCon held December 1996) have the goal of developing measures to strengthen compliance with the BWC; this project supports U.S. policy makers by analyzing and prioritizing proposed confidence-building measures. RDT&E following the RevCons will be essential in continuing this process and ensuring confidence-building is balanced against the need to protect legitimate DoD/U.S. equities. The project also provides technical assessments of transparency measures that are being reviewed for inclusion in a series of planned exchange visits among the U.S./UK/Russia, in accordance with the 1992 Trilateral Statement; the goal is to resolve ambiguities in compliance with the BWC as well as to promote openness on legitimate military BW defense programs.

This project descriptive plan supports the JCS Joint Warfighting Capability of counterproliferation.

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Project CC - Chemical/Biological Arms Control Technology (cont'd) -

FY 1996 Accomplishments

Implementation and Compliance ($7.4M)

Continued development and documentation for a Chemical Accountability Management Information Network (CAMIN).

Deployed an interim operational capability to CAMIN designated sites and migrated all CW stockpile information to this database.

Delivered Chemical Weapons Convention Information Management System (CWCIMS) to the Organization for the Prohibition of Chemical Weapons (OPCW).

Continued test and evaluation of recommended inspection equipment and procedures.

Continued development and improvement of on-site analytical methods, to include an interim on-site method for the Gas Chromatograph/Mass Spectrometer (GC/MS) to analyze scheduled compounds in the CWC and initiating a U.S./Finnish Joint project to improve methods for sample extraction and preparation.

Completed testing of Series 1 Modular Laboratory.

Completed development of initial Non-Destructive Evaluation (NDE) systems.

Provided technical support to OSD (Policy) and U.S. Delegation to the Preparatory Commission (PrepCom) in developing criteria, recommendations, procedures, and guidelines to establish the U.S. position on and responses to issues raised concerning verification/implementation provisions of the CWC.

Developed analytical data software for CWC-specific equipment.

Provided technical and treaty support to OSD (Policy) on issues related to strengthening the BWC, including preparation and conduct of National Trial Visits, support to activities preparing for the 1996 Review Conference (RevCon), and support to the negotiation process.

Provided technical support to OSD (Policy) on issues related to the Joint Statement of U.S./UK/Russia on Biological Weapons.

Assessed historical U.S. offensive biological weapons information for inclusion in the biological weapons database.

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Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Technical Assessments (2.2M)

Continued validation of on-site analytical methods, evaluated new technologies, and evaluated portable analytical equipment.

Conducted technical peer review process of analytical methods and other papers and issues pertaining to sampling and analysis.

Improvements ($.5M)

Initiated improved algorithms in Acoustic Resonance Spectrometer (ARS) NDE system.

Technology Development ($1.0M)

Continued development of Swept Frequency Acoustic Interferometry (SFAI) NDE technology.

Adapted more advanced state-of-the-art spectroscopy technologies that can be used in instruments during on-site sampling and analysis.

Initiated commercialization of the ARS NDE system.

FY 1997 Plans

Implementation and Compliance ($3.8M)

Deploy CAMIN system and increased capabilities towards the final full operational capability (FOC).

Complete validation of Full Operational Capability (FOC) for CAMIN.

Transition operational control of CAMIN to USACBDCOM.

Conduct test and evaluation of new commercial-off-the-shelf (COTS) equipment for potential inclusion in the modular lab.

Provide training and develop documentation on CAMIN.

Support OPCW inspection equipment/procedures test & evaluation.

Continue development of on-site sampling and analytical methods.

Continue technical support to OSD (Policy) to establish the U.S. position on and responses to issues raised concerning verification/implementation provisions of the CWC.

Conduct protocol/vulnerability assessment of DoD equities for BWC RevCon proposals for improved compliance.

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Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Provide technical support to activities preparing for the 1996 BWC RevCon.

Update and maintain BW history database.

Continue technical support to OSD (Policy) on issues related to the Joint Statement of US/UK/Russia on Biological Weapons.

Technical Assessments ($.9M)

Continue validation of on-site sampling and analytical methods developed in DSWA programs.

Improvements ($1.8M)

Develop improved decision algorithm for the ARS system to provide greater confidence in identification of unknown chemical munitions.

Develop Quality Assurance/Quality Control protocols for analytical data software.

Technology Development ($.6M)

Initiate a comprehensive program for filling OPCW-identified on-site inspection technology gaps.

Continue to adapt more advanced spectroscopy technologies that can be used in instruments during on-site sampling and analysis.

Adapt innovative sensing technologies for potential CWC verification applications.

Initiate commercialization of SFAI.

Initiate engineering development of the hand-held gas chromatograph chemical detector.

Initiate project to integrate sampling and analysis components into an on-site laboratory system.

FY 1998 Plans

Technical Assessments ($5.1M)

Continue development and evaluation of on-site sampling and analytical methods.

Continue technical support to CWC Policy Interagency Working Group to establish the U.S. position on and responses to issues raised concerning verification/implementation provisions of the CWC.

Conduct assessments of commercial-off-the-shelf (COTS) equipment for potential use in the On-Site Lab.

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Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Continue protocol vulnerability assessments of DoD equities for BWC RevCon proposals for improved compliance.
Provide technical support to BW Trilateral Statement Negotiations and Visits.
Provide technical assessments in preparation for BWC National Trial and Trilateral exchange visits.
Conduct technical lessons learned assessments following BWC National Trial and Trilateral Exchange Visits.
Expand and maintain BW History and Database.

Technology Development ($4.4M)

Conduct technical peer review process of analytical methods and other papers and issues pertaining to sampling and analysis.
Evaluate emerging sampling, sample preparation, and analytical technologies to meet OPCW-identified technology gaps.
Continue to adapt more advanced spectroscopy technologies to improve on-site sampling and analysis.
Continue engineering development of the hand-held chemical detector.
Support OPCW inspection equipment/procedures test & evaluation.
Continue developing analytical data software for CWC-specific equipment.
Initiate Phase II Analytical Software development.
Support commercialization and provide improved sensitivities to flow injection trace gas analyzer for lewisite monitoring.
Support commercialization and provide improved algorithms in the SFAI.

FY 1999 Plans

Technical Assessments ($5.6M)

Continue support to Interagency for BWC RevCon.
Provide support to BW Trilateral Visits.
Continue technical support to CWC Policy Interagency Working Group to establish the U.S. position on and responses to issues raised concerning verification/implementation provisions of the CWC.
Provide technical assessment of BW protocols and DoD vulnerabilities.
Continue validation of on-site sampling and analytical methods developed in DSWA programs.

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Project CC - Chemical/Biological Arms Control Technology (cont'd) -

Expand and maintain BW History and Database.

Technology Development ($4.5M)

Evaluate emerging sampling, sample preparation, and analytical technologies as they become available.
Complete development of technologies and equipment to fill OPCW-identified on-site inspection technology gaps.
Continue to adapt more advanced spectroscopy technologies to improve on-site sampling and analysis.
Develop innovative sensing technologies for potential CWC verification applications.
Support OPCW inspection equipment/procedures test & evaluation.
Complete engineering development of the hand-held chemical detector.
Continue engineering development of the On-Site Laboratory.

Improvements ($.7M)

Improve chemical agent characterization and sensitivities of non-destructive evaluation technologies.

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APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-Wide/Advanced Technology Development - BA3	R-1 ITEM NOMENCLATURE Verification Technology Demonstration; 0603711H

Project CD - Nuclear Arms Control Technology - This project consists of Research Development Test and Evaluation (RDT&E) activities required to provide a comprehensive and integrated DoD research and development program to support preparation, implementation, compliance, and verification of the CTBT. This project is consistent with the direction given December 1995 by the Deputy Secretary of Defense (Implementation of the Comprehensive Test Ban Treaty), May 1996 by the Under Secretary of Defense for Acquisition and Technology (Revised Arms Control Treaties and Agreements Planning Assumptions) and the August 1996 Program Decision Memorandum 1 that describes funding for CTBT safeguards support and funding required for CTBT entry into force.

The CTBT arms control activities are the following:

U.S. CTBT International Monitoring System (IMS) Sensors-- The Treaty will require the U.S. to contribute 40 stations to the IMS . This funding supports R&D, implementation, operations, and maintenance for the 24 stations not covered under funding from other sources.

CTBT International Data Center (IDC)-- In the CTBT negotiations, the U.S. committed to develop, prototype and transition to the CTBT international organization an International Data Center which would have the capability to acquire, archive, process and analyze data from approximately 320 sensor stations positioned around the globe, and to disseminate raw data and products to all States Parties. The IDC will serve as the central data processing hub for the Treaty verification regime, and will be located in Vienna, Austria, at the headquarters of the CTBT international organization. The IDC will be critical for supporting U.S. objectives for CTBT compliance and global monioring.

U.S. CTBT Interface-- The U.S. must develop, integrate, test, evaluate, operate and maintain an interface to the international CTBT organization to support routing of data between U.S. facilities and the IDC; to support the U.S. National Authority in the execution of Treaty-related exchanges and decisions; and to function as a backup data archive, and research analysis center. This funding supports initial prototyping of the interface.

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Project CD - Nuclear Arms Control Technology (cont'd) -
Monitoring Safeguards RDT&E-- The U.S. agreement to a zero-yield CTBT is contingent upon the capability to independently monitor nuclear activities worldwide. Understanding, processing and analyzing monitoring data and providing actionable information based on these data and products will require significant basic research and exploratory development in the areas of seismic, hydroacoustic, infrasound, and radionuclide monitoring. This RDT&E work has no parallel in other arms control treaties; this Treaty requires an understanding of geophysical and physical phenomena that have not yet been studied or understood for any other purpose. The objectives of the R&D program are to enhance monitoring capabilities to meet current CTBT standards at decreasing cost over time.

Implementation/Compliance Support-- Measures are identified within the Treaty language to minimize the number of frivolous OSI requests and to maximize the early resolution of events of concern. A regular procedure for reporting large conventional explosions so that the signals detected do not raise suspicions will greatly reduce the number of OSI requests, and consequently the cost of participating in the Treaty. When events occur which cannot be resolved through confidence-building measures or consultation and clarification, U.S. decisionmakers must have the ability to react appropriately and in a timely fashion for both offensive situations (where the U.S. suspects a Treaty violation), and defensive situations (where the U.S. is challenged by another State Party over an ambiguous event). This funding supports initial prototyping of the decision systems and databases needed to address these issues.

FY 1998 Plans
U.S. CTBT IMS Sensors ($8.5M)

- Replace Wake Island hydroacoustic station.
- Procure and install infrasound stations.
- Install aerosol samplers at four radionuclide stations.
- Install required seismic stations and provide needed upgrades to existing seismic stations.

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Project CD - Nuclear Arms Control Technology (cont'd) -

CTBT IDC ($32.5M)

Integrate proven seismic, hydroacoustic, infrasound, and radionuclide data exploitation techniques into the automated and interactive systems.

Deliver limited IDC components to support initial operation and operational testing in Vienna.

Operate in parallel the interim and provisional IDCs.

Draft software manuals.

U.S. CTBT Interface ($3.8M)

Begin tests with PrepCom to demonstrate initial operating capability and to support data communication and backup data archive and analysis capability.

Monitoring Safeguards RDT&E ($6.0M)

Derive new methods for enhancing detection, location, screening and identification for seismic, oceanic and atmospheric events.

Develop computerized, rapidly running techniques/algorithms to detect, locate, and identify optical signals from operational systems.

Develop improved understanding of source phenomenology and propagation for events near detection threshold.

Implementation/Compliance Support ($3.5M)

Develop the types of information to be presented to policy/decision makers.

Initiate database development for treaty-required information exchanges.

Conduct implementation and compliance assessments on selected CTBT issues.

FY 1999 Plans

U.S. CTBT IMS Sensors ($1.3M)

All stations for which the U.S. is responsible to be operational and supplying data to the IDC.

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Project CD - Nuclear Arms Control Technology (cont'd) -

CTBT IDC ($10.1M)

Delivery of IDC to CTBT international organization.

U.S. CTBT Interface ($2.7M)

Test U.S. Interface in conjunction with the CTBT IDC acceptance test.

Monitoring Safeguards RDT&E ($5.8M)

Calibrate new methods for enhancing detection, location, screening and identification of seismic, oceanic, and atmospheric events.

Evolve new methods for multi-technique data fusion and calibrate visualization.

Continued studies on source phenomenology and propagation for events near the detection threshold and near environmental boundaries.

Implementation and Compliance ($2.0M)

Assemble information for policy/decision makers in a coherent format.

Finalize database for treaty-required information exchanges.

Continue implementation and compliance assessments on selected CTBT issues.

Continue assessing alternative positions for the U.S. to present at the CTBT Preparatory Commission.

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B. Program Change Summary

	FY1996	FY1997	FY1998	FY1999
Previous President's Budget	32.5	26.2	29.3	30.5
Current President's Budget	32.3	25.6	83.3	50.2

Change Summary Explanation:

The Nuclear Treaty Area has been added to the Program Element beginning in FY98 as directed by Program Decision Memorandum 1 from the Deputy, Secretary of Defense. However, the decision required a $2M per year reduction in FY98 and FY99 seriously impacting execution in the Strategic, Conventional and Chemical/Biological areas of the Arms Control Technology Program. In the Strategic Arms Control area, capabilities to monitor a START II follow-on agreement and support emerging data exchanges requirements will not be developed. In the Conventional Arms Control, area preparation for meeting anti-personnel landmine ban database requirements must be delayed for one year, thus placing the Department of Defense in the position of not supporting the President's initiative to accelerate conclusion of the ban. In the Chemical Arms Control area, the reduction necessitates delaying development of advanced munitions sampling capabilities that would significantly reduce inspectors exposed to lethal chemical agents.

C. Other Program Funding Summary. None.

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D. Schedule Profile

	FY1996				FY1997				FY1998				FY1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project CA (Strategic Arms Control Technology)																
Engineering Milestones																
Complete prototype field testing of Arms Control Verification Gravity Gradiometer (ACVGG)								X								
Complete Technical On-Site Inspection closeout/transfer of control	X															
Complete Anti-Ballistic Missile/Theater Missile Defense Interceptor Technical Assessment					X											
Complete Strategic Weapons and Nuclear Materials verification assessment								X								
Complete Treaty Limited Item Detection, Identification and Tracking Technical Assessment					X											
Other Program Events																
START Central Data System (SCDS) Initial Operational Capability for START II						X										
SCDS documentation completed and system transitioned to OSIA						X										
Demonstrate prototype Object Pattern Recognition technology								X								
Demonstrate improved portable neutron detector								X								

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D. Schedule Profile (cont'd)

	FY1996				FY1997				FY1998				FY1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project CA (Strategic Arms Control Technology)																
Other Program Event (cont'd)																
Demonstrate Wide Area Tracking System for detecting nuclear weapons in ground transit							X									
Demonstrate Automated Tracking Management System performance on Russian Railcar							X									
Demonstrate Corral Monitoring System prototype development							X									
Completed abaktses for on-site activities and confidence building measures for CTBT							X									
Project CB (Conventional Arms Control																
T&E Milestones																
Complete flight testing of Synthetic Aperture Open Skies and Data Annotation Recording and Mapping System							X									
Other Program Events																
Deliver Open Skies Management and Planning System Blocks 2A, 3 and 4					X		X				X					

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D. Schedule Profile (cont'd)

	FY1996				FY1997				FY1998				FY1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project CB (Conventional Arms Control)																
Other Program Event (cont'd)																
Deliver upgraded Open Skies Telephone System to OSIA						X										
Deliver augmented climatological and ground feature models to OSIA							X									
Deliver notifications tool to OSIA for Conventional Armed Forces in Europe/Confidence- and Security-Building Measure notifications			X													
Deliver automated collection and reporting system to meet the Transparency in Armaments and Global Exchange of Military Information reporting requirements to the Joint Staff	X															
Initiate development of the extended digital processor											X					
Initiate development of inspection planning tools								X								
Engineering Milestones																
Complete standard digital format							X									

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D. Schedule Profile (cont'd)

	FY1996				FY1997				FY1998				FY1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project CC (Chemical Weapons Convention)																
Engineering Milestones																
Complete Lewisite detector component fabrication					X											
Complete field prototype Lewisite detector							X									
Complete production prototype Acoustic Resonance Spectrometer (ARS)						X										
Complete lab prototype Swept Frequency Acoustic Interferometry (SFAI)						X										
Complete field prototype Swept Frequency Resonance Spectrometry (SFAI)						X										
Complete production prototype SFAI											X					
Complete field prototype Supercritical Fluid Extractor (SFE)						X										
Complete production prototype SFE											X					
On-Site laboratory system integration										X						
On-Site laboratory prototype development											X					

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D. Schedule Profile (cont'd)

	FY1996				FY1997				FY1998				FY1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project CC (Chemical Weapons Convention)																
Engineering Milestones (cont'd)																
Develop handheld detector prototype											X					
T&E Milestones																
Conduct T&E of field prototype Lewisite detector							X									
Conduct T&E of production prototype ARS						X										
Conduct T&E of field prototype SFAI						X										
Complete T&E of SFE							X									
Complete baseline T&E of Series I Modular Lab										X						
Conduct T&E of On-Site laboratory																X
Conduct T&E prototype handheld detector														X		
Other Program Events																
Complete technical support in preparation of Biological Weapons Convention Review Conference					X											
Complete development of Chemical Weapons Convention Information Management System (CWCIMS)		X														

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D. Schedule Profile (cont'd)

	FY1996				FY1997				FY1998				FY1999			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project CC (Chemical Weapons Convention)																
Other Program Events																
Deliver CWCIMS to Organization for the Prohibition of Chemical Weapons			X													
Complete development of Chemical Accountability Management Information Network						X										

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D. Schedule Profile (cont'd)

	FY1998 1 2 3 4	FY1999 1 2 3 4
Project CD (Nuclear Arms Control Technology)		
Engineering Milestones		
Integrate proven seismic, hydroacoustic, infrasound, and radionuclide data exploitation techniques into the automated and interactive systems	X	
Derive methods for enhancing detection, location, screening, and identification for seismic, oceanic, and atmospheric events	X	
Develop improved understanding of source phenomenology and propagation for events near detection threshold	X	
Develop techniques/algorithms to detect, locate, and to identify optical signals from operational systems	X	
Deliver limited IDC components to support initial, partial operation in Vienna	X	
Calibrate new methods for enhancing detection, location, screening, and identification of seismic, oceanic, and atmospheric events		X
Evolve new methods for multi-technique data fusion and visualization		X
Continued studies on source phenomenology and propagation for events near the detection threshold and near environmental boundaries		X

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D. Schedule Profile (cont'd)

	FY1998				FY1999			
	1	2	3	4	1	2	3	4
Project CD (Nuclear Arms Control Technology)								
T&E Milestones								
Operate in parallel the interim and provisional IDCs			X					
Begin tests with PrepCom to display initial operation capability				X				
Replace Wake Island hydroacoustic station				X				
Procure and install infrasound stations				X				
Install aerosol samplers at four radionuclide stations				X				
Install required seismic stations and provide needed upgrades to existing seismic stations	X							
Deliver of IDC to CTBT international organization and acceptance testing						X		
All U.S. stations operational and supplying data to the IDC						X		
Test interface in conjunction with CTBT IDC acceptance test								X

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D. Schedule Profile (cont'd)

	FY1998				FY1999			
	1	2	3	4	1	2	3	4
Project CD (Nuclear Arms Control Technology)								
Other Program Events								
Develop the types of information to be presented to policy/decision makers			X					
Initiate database development for treaty-required information exchanges			X					
Conduct implementation and compliance assessments on selected CTBT issues			X					
Draft software manuals		X						
Assemble information for decision makers in a coherent format								X
Finalize database for treaty-required information exchanges								X
Continue assessing alternative U.S. positions for the PrepCom								X
Continue implementation and compliance assessments on selected CTBT issues								X